THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LV. No. 1414.] LONDON, JUNE 17, 1890. [42ND YEAR. Price 6d.

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SCRUBBERS.
PURIFIERS.
RETORT-APPLIANCES.
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DAVIS'S AMMONIA STILLS.

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Illustrated Gas-Works Catalogue.

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PARKER & LESTER,
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THE ONLY MAKERS OF
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Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
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WOLSTON'S TORBAY PAINTS
Special Quotations to Gas Companies.
23, GREAT GEORGE ST., WESTMINSTER, S.W.

CEMENT
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Portland Cement
MANUFACTURED BY
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STOREAGE CAPACITY 10,000 Tons.

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SPENT LIMES NO LONGER WASTE PRODUCTS.

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All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

— REGENERATIVE SETTINGS OF RETORTS. —

Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable, while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

C. & W. WALKER.

GASHOLDERS; PURIFIERS;
PURIFYING MACHINES;
CO_2 AND TAR-EXTRACTING WASHERS; SCRUBBERS;
SULPHATE & SULPHUR PLANT;
RETORT MOUTHPIECES; CONDENSERS;
LIFTING APPARATUS; CENTRE AND FOUR-WAY VALVES;
SLIDE VALVES; TAR BURNERS; &C. &C.
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ADDRESSES: 8, Finsbury Circus, London, E.C.; Midland Iron-Works, Donnington, near Newport, Shropshire.
"FORTRESS LONDON." "FORTRESS DONNINGTON."—Telegraphic.

SAWER AND PURVES,

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GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER,

Manufacturers of

IMPROVED CONSUMER'S WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

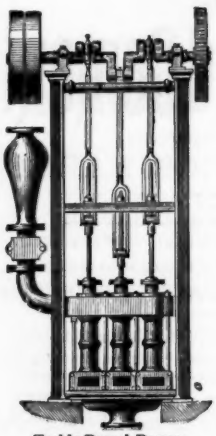
AND

IMPROVED DRY GAS-METERS;

Also Sole Makers of THORP AND MARSH'S PATENT CASH PREPAYMENT ATTACHMENT FOR GAS-METERS.

STEAM & HAND PUMPS FOR GAS-WORKS.

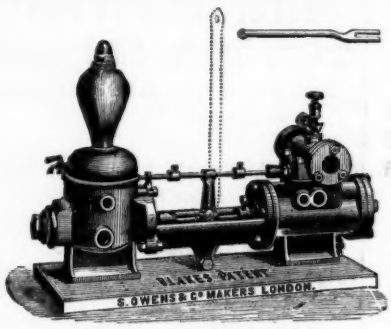
FOR PUMPING TAR, WATER, AND LIQUOR.



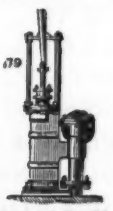
Treble-Barrel Pumps in Frame.

Syphon Pump.

Double-Barrel Force-Pump in Frame.



BLAKE'S
PATENT
STEAM PUMPS.
20,000 IN USE.



Improved Double Action Pump.

Cast-Iron Hand-Pump.

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S. OWENS & CO., Hydraulic, Gas, & General Engineers, WHITEFRIARS ST., LONDON, E.C.

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S. O. and Co.'s New Catalogue of Gas Apparatus and General Machinery can be had on application.

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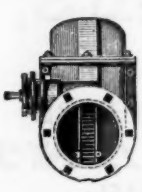
SLIDE VALVES,
WITH RACK & PINION,
OR
Internal or External
SCREWS, of all Sizes.

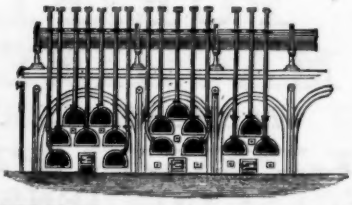
GASHOLDERS,
AND
Gasholder Tanks.

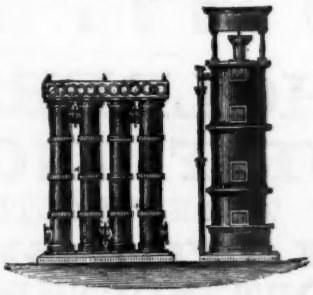
CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description.
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c.

PATENT
CENTRE VALVES
for working Purifiers.
Also Bye-Pass & Stop Valves.







PURIFIERS with Planed Joints,

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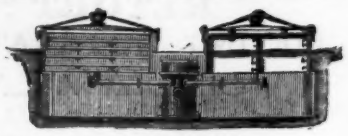
WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

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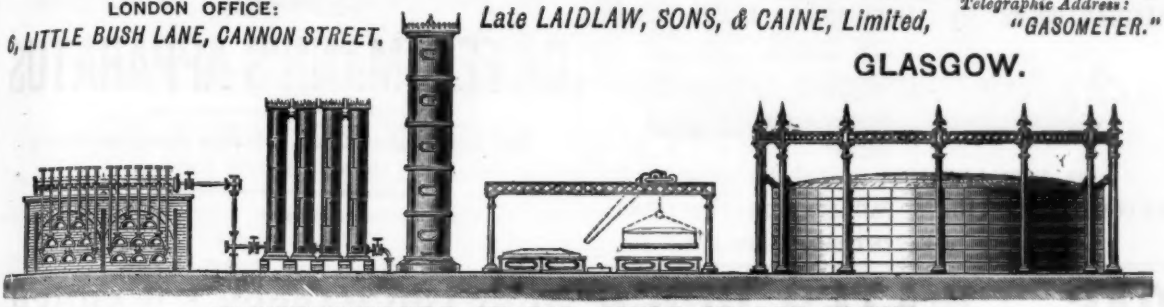
Late LAIDLAW, SONS, & CAINE, Limited,

Telegraphic Address:
"GASOMETER."

GLASGOW.



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RETORT-BENCH FITTINGS; SIEMENS'S REGENERATIVE AND ORDINARY FURNACES;
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DRY AND HYDRAULIC CENTRE-VALVES;
HYDRAULIC AND HAND-POWER LIFTING APPARATUS;
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PROMENADE PIERS AND LOADING WHARVES.

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HENDERSON'S Patent Retorts, Condensers, Stills, Cast and Wrought Iron Tanks, Ammonia Stills, Wrought-Iron Gas-Mains, &c., &c.

DESCRIPTIVE SPECIFICATIONS AND ESTIMATES ON APPLICATION.

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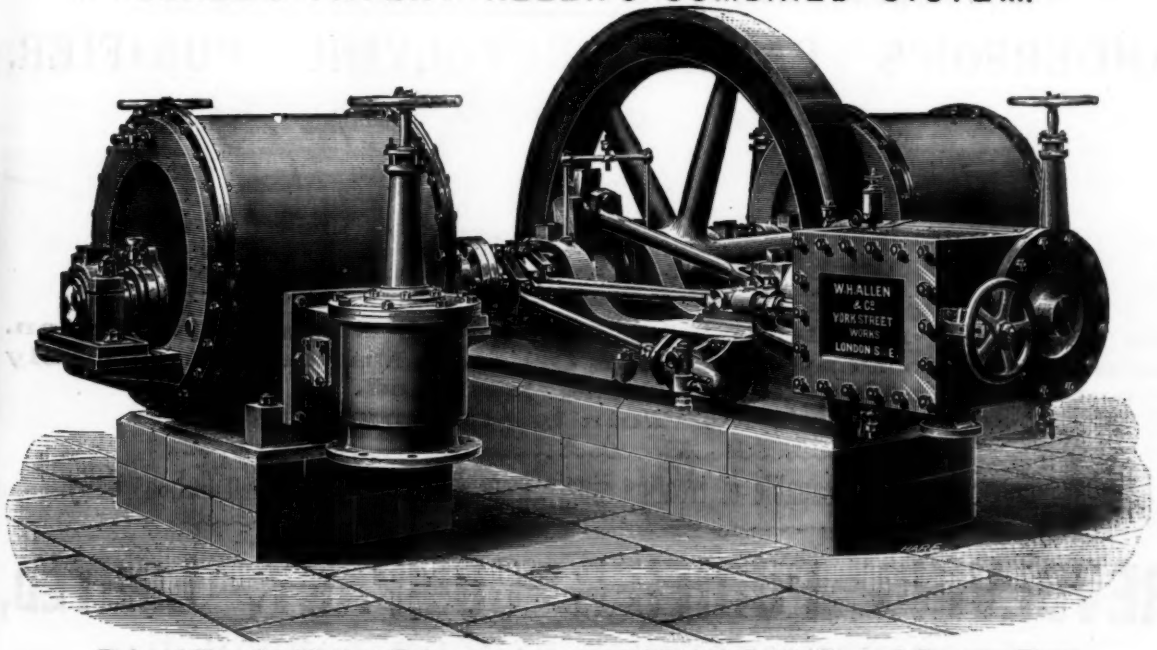
York Street Works, LAMBETH, LONDON, S.E.,

MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY.

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.



Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

JOHN HALL & CO.,

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MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

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CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

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SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE

Sole Agents and Manufacturers,

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ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

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CHANCE BROTHERS, OLDBURY (4 Apparatus).
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NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

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WIDNES	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
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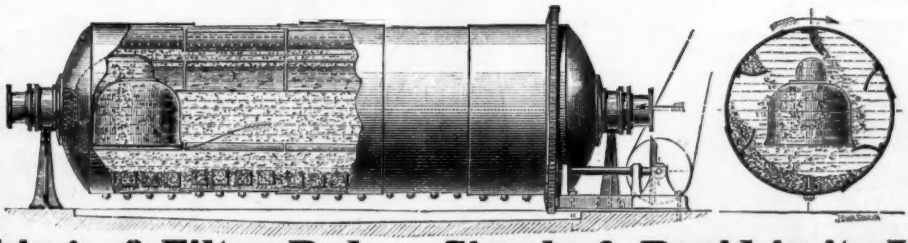
WATER PURIFICATION.

RIVER WATER and SEWAGE EFFLUENT successfully and economically treated in large volumes, by AGITATION WITH METALLIC IRON in

ANDERSON'S PATENT REVOLVING PURIFIER.



No Choking of Filter-Beds.
Colour due to Peat and Clay entirely Removed.
Simple & Rapid in its Action.
Organic Matter Considerably Reduced.
Microbes Totally Removed.

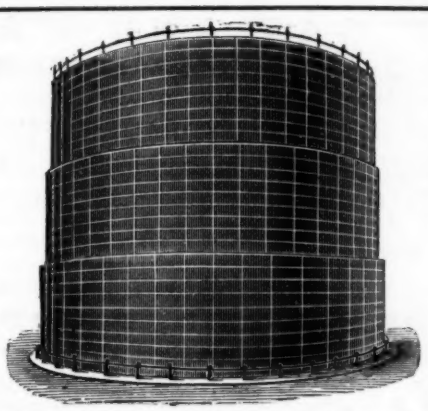
Made in Fourteen Sizes, capable of treating singly from **4000** to **1¼** Million Gallons daily.

REVOLVING PURIFIER COMPANY, LIMITED,

DOCK HOUSE, BILLITER STREET, LONDON, E.C.

REVOLUTION
IN GASHOLDER CONSTRUCTION.
(GADD & MASON'S PATENTS.)

IMMENSE SAVING IN COST.
NO COLUMNS. NO FRAMING.
NO PIERS ROUND TANK.
GREATER STABILITY.
TILTING IMPOSSIBLE.



In Holders for Export a very large additional saving is effected in Carriage, Freight, Transport and Insurance; the Weight being reduced nearly **50 PER CENT.**

Tank Construction rendered simpler and very much cheaper; the Piers and heavy Base Stones being dispensed with.

Engineers intending to extend their Gas Storeage should not fail to see the Two-Lift Holder erected for the Northwich Gas Company.

ADMITTED BY EMINENT ENGINEERS TO BE THE SYSTEM OF THE FUTURE.

Telegrams: "SPIRAL MANCHESTER."

THE PATENT GASHOLDER SYNDICATE,
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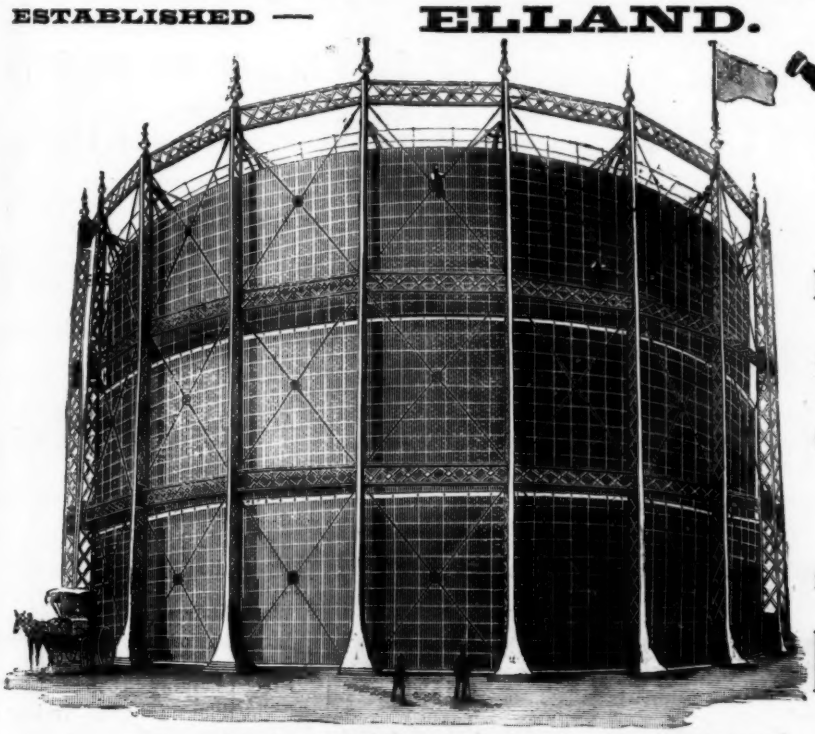
R. DEMPSTER & SONS, Ltd.,
ROSE MOUNT GAS ENGINEERING WORKS,
ESTABLISHED — **ELLAND.** — 1855.



The above illustrates a TREBLE-LIFT GASHOLDER, 194, 191, and 188 feet diameter by 35 feet deep each, as made for the MELBOURNE GAS COMPANY.

GAS AND CHEMICAL PLANT OF EVERY DESCRIPTION — ALL SUNDRIES SUPPLIED.

OUR
ROTARY EXHAUSTERS
Are acknowledged to excel in efficiency and finish.

OUR IMPROVED
COKE-BREAKING MACHINE
Is a pronounced success.
See Last Week's Issue.

Designs, Specifications, and Estimates submitted on application to

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ELLAND.

Wrought-Iron

And Fittings and Accessories.

LAMBERT BROS., WALSALL,

MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c.; AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
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HANNA, DONALD, & WILSON,

(ESTABLISHED 1851)

GAS ENGINEERS & CONTRACTORS

FOR THE

ERECTION OF GAS AND WATER WORKS,

TELESCOPIC AND SINGLE-LIFT GASHOLDERS,

CAST AND WROUGHT IRON GASHOLDER-TANKS,

IMPROVED FIXED OR TRAVELLING HYDRAULIC PURIFIER-COVER LIFTERS,

PURIFIERS, CONDENSERS, SCRUBBERS, EXHAUSTERS, AND PUMPING-ENGINES,

TAR AND LIQUOR PUMPS, HYDRAULIC SLUICE AND SLIDE VALVES, LAMP-POSTS AND HYDRANTS COMBINED.

DESIGNS AND ESTIMATES SUPPLIED ON APPLICATION.

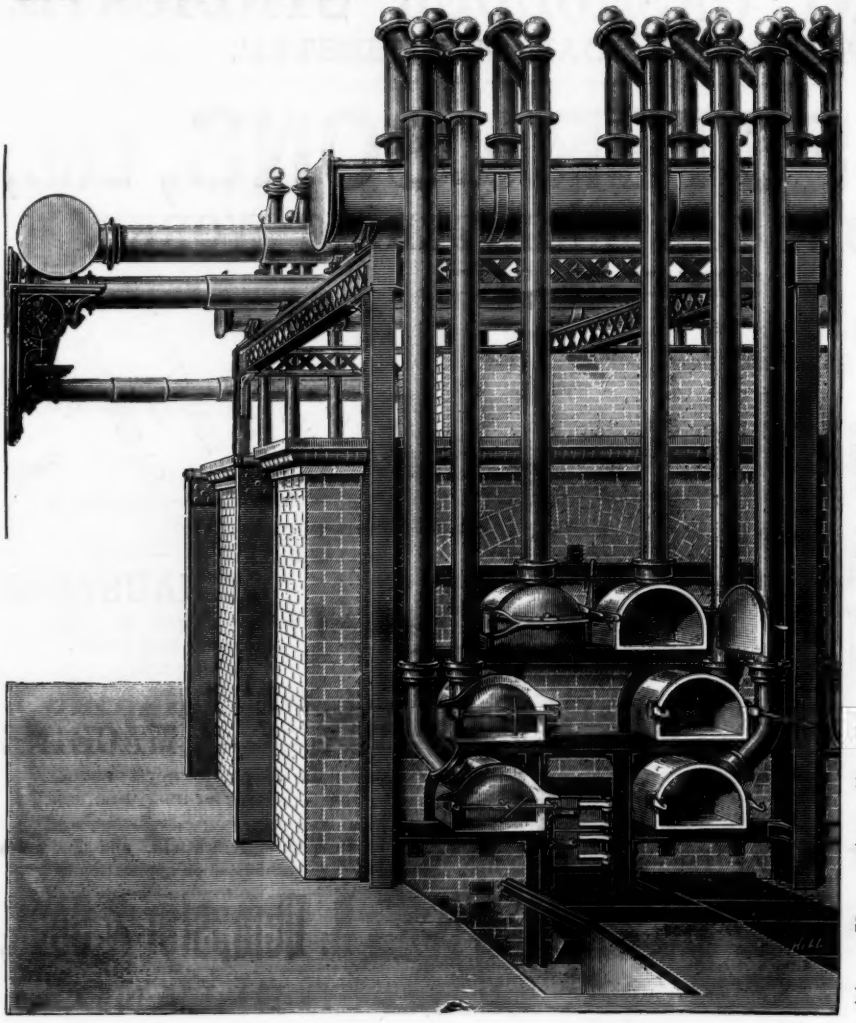
LONDON OFFICE: 9, FENCHURCH STREET, E.C.

ABERCORN FOUNDRY & ABBEY WORKS, PAISLEY, N.B.

R. & J. DEMPSTER,

Engineers, Ironfounders, and Contractors,

Gas Plant Works, Newton Heath, MANCHESTER.



RETORT-BENCH

SHOWING APPLICATION OF

MESSRS. R. & J. DEMPSTER'S

PATENT

Regenerative Furnace

TO A

BED OF SIX RETORTS.

These Furnaces are very economical in the consumption of Fuel and in the wear and tear of Retorts, and require a minimum of Excavation.

Retort-Benches erected complete, with or without Regenerative Furnaces, and with Brick, Clay, or Iron Retorts.

Mouthpieces with self-sealing Lids.

Stamped Retort-Lids, in Iron or Steel.

Arms, Cross-Bars, and Screws.

Patent Wrought-Iron Ascension-Pipes.

Furnace Frames and Arch-Pipes in great variety.

Hydraulic Mains of all sections.

Hydraulic Main Regulating Valves.

Wrought-Iron Foul Mains.

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Steel Charging Scoops.

Sight Plugs in great variety of Designs and Sizes.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

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MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS
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CLAYTON SON & CO. LTD.

MAKE A

SPECIALTY OF

GASHOLDERS

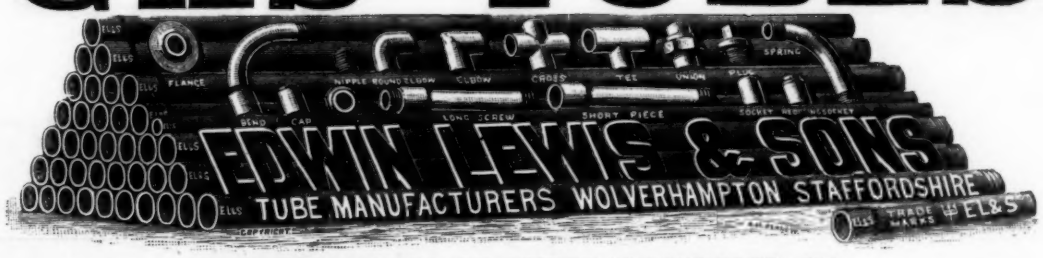
AND MAKERS OF

GAS PLANT OF EVERY DESCRIPTION.

REG^D TELEGRAPHIC ADDRESS: "GAS LEEDS"

ESTABLISHED 1825.

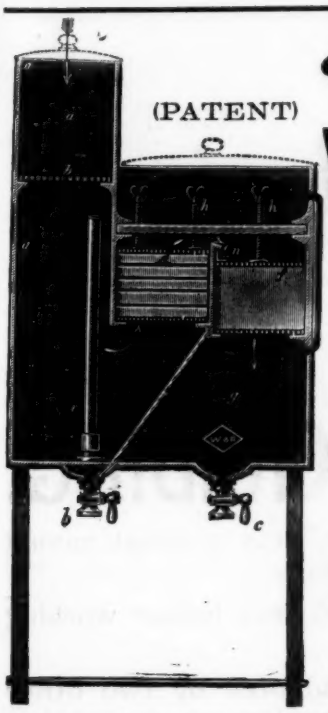
GAS TUBES



MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.



THE

"Diamond"

(PATENT)

Waste Oil Filter

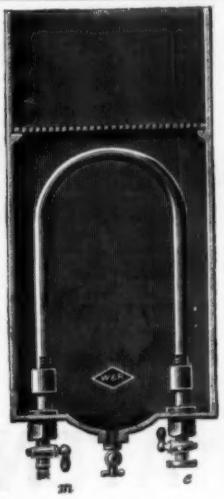
FOR

Purifying Refuse Oil and Grease, in Engine-Rooms, Boiler-Houses, &c.

PAYS FOR ITSELF IN A VERY SHORT TIME.

Used by

Stafford Corporation Gas-Works; L.B. & S.C. Ry. Co., New Cross; Union Bank, Ltd., London; H.H. The Maharajah of Mysore; Plymouth Works; &c., &c.



Prices and Particulars on application to

WOODHOUSE & RAWSON

UNITED, LIMITED,

88, QUEEN VICTORIA STREET, LONDON, E.C.;

41, PICCADILLY, BRADFORD; & CORNBROOK TELEGRAPH WORKS, MANCHESTER.

ASHMORE, BENSON, PEASE, & Co., Ld.,

GAS PLANT MANUFACTURERS,

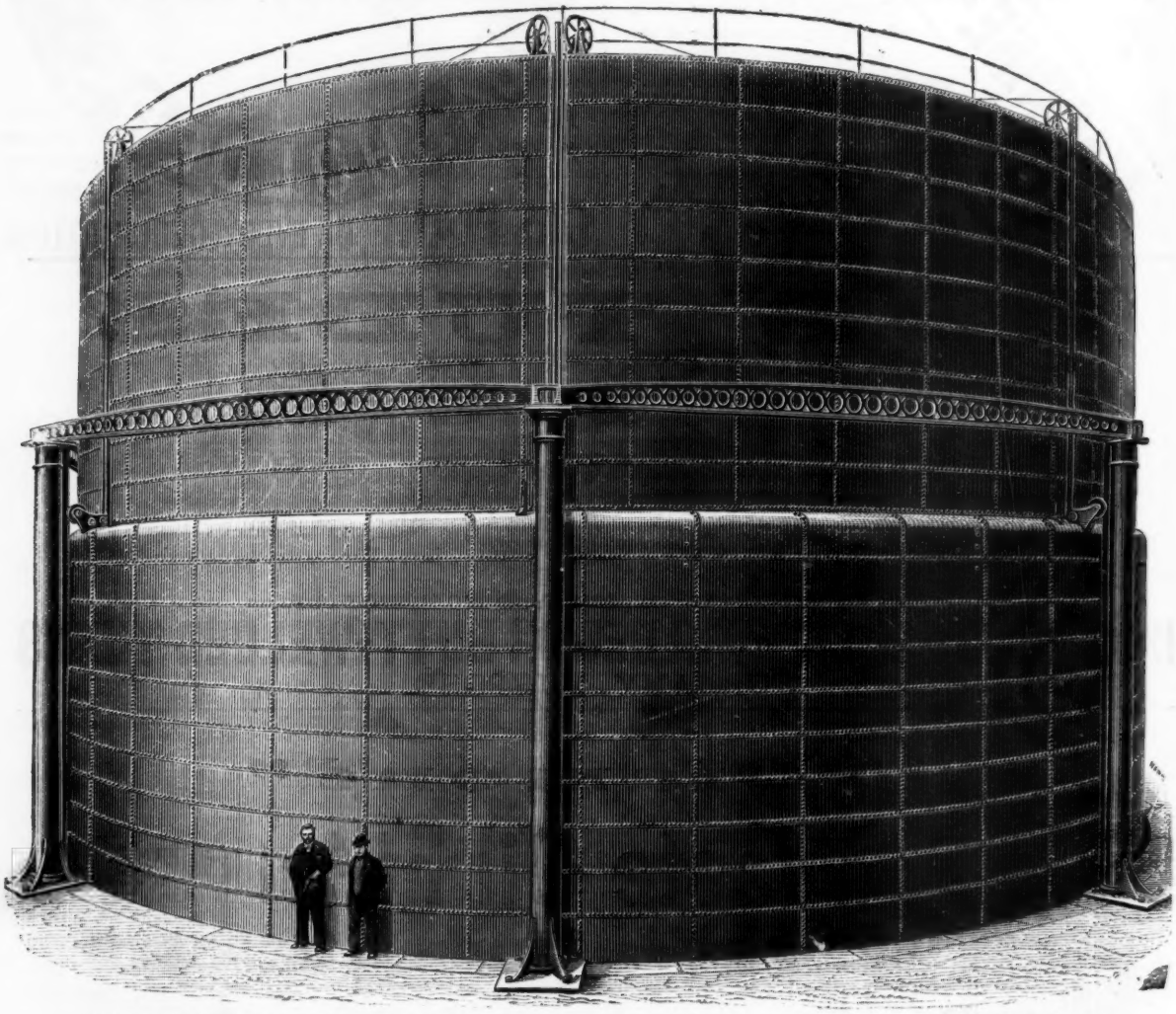
STOCKTON-ON-TEES,

SOLE MAKERS OF

DAVIS'S PATENT AMMONIA STILLS, which are the cheapest and most effective in existence.

Sole Makers of **GREEN'S PATENT SCREENS FOR SCRUBBERS.**

Makers of **SOMERVILLE'S PATENT DIP REDUCERS.**



HASLINGDEN GASHOLDER, 80 ft. by 22 ft., showing application of

PEASE'S

PATENT WIRE-ROPE GUIDING.

In adding second and third lifts to present holders, it effects a great saving in cost, and vastly increases the storeage.

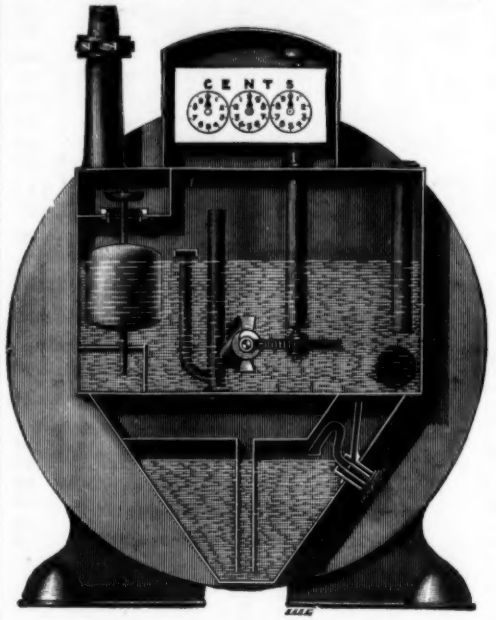
The Manchester Corporation have the third lift of a 100 feet holder working by this System.

PEASE'S WIRE ROPES have been also adopted by two other Companies for completely new telescopic holders.

THE SYPHON OVERFLOW

— Wm. Cowan's Patent. —

To suppose, as some do, that the main object of the "Syphon Overflow" is to promote the convenience of inspectors and others who "water" meters, is to misapprehend the chief purpose of the invention. That the convenience of inspectors is promoted by the Syphon Overflow is a fact that admits of no doubt whatever, because the watering of meters is thereby greatly facilitated; but it is a mistake to fix attention upon this result, and to regard it as the only one attained. To do this is to lose sight of the chief purposes the Syphon Overflow was designed to secure.



These purposes were—

1st.—The **speedy** attainment of **exactly the same water line** on each occasion of watering.

2nd.—The **absolute certainty** of this water line being attained.

3rd.—The **impossibility** of any water afterwards finding its way into the waste-box.

The first and second of these conditions secure the interests of the gas company, whilst the third greatly promotes the convenience of the consumer, for reasons that are well known.

Who that has had experience of Wet Meters does not know the disadvantages of the "Low Spout?" The slowness with which it adjusts the water line, and the patience required while this is being done, are matters of every-day experience. It is therefore no wonder that the "Syphon Overflow" is regarded as one of the most important improvements ever made in the Wet Gas-Meter. It is not only an important improvement **in itself,** but it possesses the property of making all previous improvements more valuable and effective. It has, indeed, made the Wet Meter a more perfect, and, in every way, a more satisfactory instrument.

Narrow views as to price often prevent the adoption of real improvements; but it would be a narrow view indeed which would prefer a "Low Spouted" Meter to one with a "Syphon Overflow," because of the trifling difference in the price of the two.

— W. & B. COWAN, —

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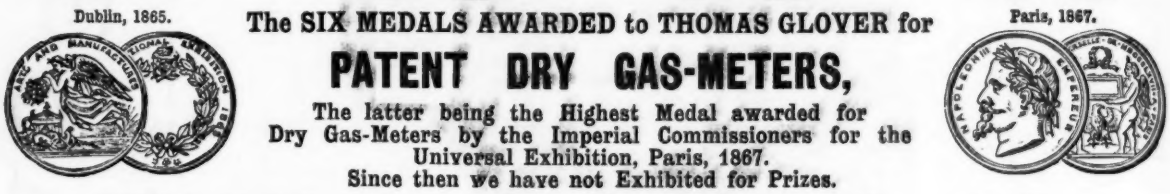

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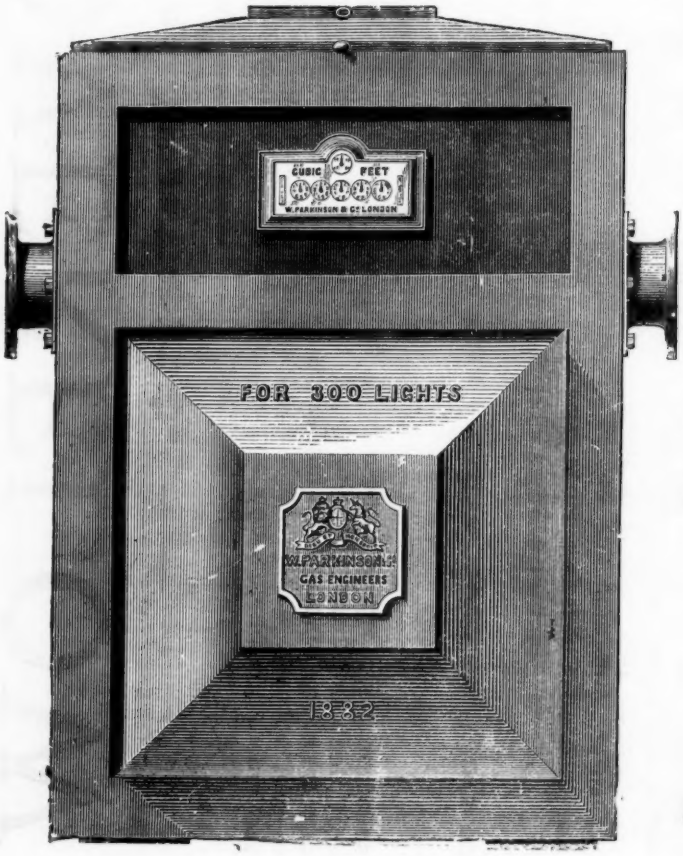

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 17, 1890.

Gas Stokers' Engagements.

The officials of the Gas Workers' Union are enraged at the progress made by managers of gas-works all over the kingdom in putting their men under long agreements, which, as they very well know, means cutting them off from the Union. At the same time, although they may fume and use bad language, they cannot really complain of the employers protecting themselves against a repetition of the risks of last winter. Gas managers had not, as a rule, before this troubled season, any agreements for service with their men of longer term than one week; although at some works, and these not among the least popular in the kingdom, it has been customary to require the winter hands to sign for three or four months, according to the prospective duration of their engagement. We understand that this has been the practice at York, where Mr. Sellers is known to treat his men with the greatest care and kindness. In the abstract, it is difficult to perceive the iniquity involved in a Gas Company or Corporation taking precautions against being left "in the lurch" at the busiest time of the year; but the Gas Workers' Union seem to hold the doctrine that they must be permitted to do everything they please, and the employers must stand still to be shot at. Hitherto, as we say, managers of gas-works have not thought it necessary to put their men under long engagements, because they have believed that by paying the highest rates of wages, and treating their hands so well in every respect that their employ is invariably sought after by the best men in the locality, they have taken the most satisfactory means of keeping their men for as long as they required them. "Why do you secure your slaves by "chains, and lock them up in prisons?" asks the old Greek moralist. "You can better bind them to your house by "the stomach than by the legs. Feed them well, and "they will nor want to run away." This saying was regarded as the highest wisdom, and was indeed too advanced for the majority of the employers of labour of the period. Yet it is a fair description of what Gas Companies have done, as a class, in regard to their workmen; and what has been their reward? The very men who, they thought, looked up to them as good paymasters, were seduced by the clamour of the first ignorant tongue that told them they had a grievance. In disappointment, the employers bided their time. The absence last winter of long agreements with the men upon whom the work of gas making depended, placed the employers at a disadvantake, which the agitators pushed to the extremest lengths. It was a weak spot which both sides recognized; and now the employers are repairing their error—to the despair of their assailants—before it can be made use of again. The regular summer hands of most Gas Companies know on which side their bread is buttered. They will not refuse to sign for any length of service, for the simple reason that they desire nothing better than to go on working for their good firm so long as they can handle rake or shovel; and they very well know that, if they refused, the winter hands would jump into their vacant places readily enough. All the shrieking of the demagogues about such a step being equivalent to signing away their birthright, these men now know to be mere wind; and they also know that if they threw up their employment on the point the Union would not repay them what they lost. There is the strength of the employers, and the weakness of the Union. The men who have stuck to their job and trusted their employers, are well off; while those who have followed the dictates of the Union and left their employment, have been abandoned by the men who promised to stand by them.

Now there is nothing to prevent every stoker in the country—the regular hands at once, and the winter hands as they come on—being put under agreement which will protect himself and his employers in time to come; for these agreements are as beneficial to the men as they are necessary to the employers. No employer will require any man to sign unless he wishes to keep that man; and, by signing, the man becomes amenable only to the Company or Corporation, as the case may be, through the accredited agent who signs the agreement with him. This means that a signed man is upon the establishment, and is no longer amenable to the whims of a foreman, or any other subordinate official. The men know very well that although, in the ordinary way, they may have been in the same employ for many years, they have not had any legal title to their berths, but could be discharged at the same notice as, and without more reason than, the newest hand taken on for a temporary purpose. An appeal would generally lie to the Engineer or Manager, in the event of a foreman having acted arbitrarily. But the remedy was only in the good will of the Manager, who could hear the petitioner or not; and if he chose to uphold the authority of the arbitrary subordinate, for the sake of discipline, the sufferer had no redress. Now, as we have explained on a former occasion, a man who has signed an agreement can only be dismissed while it endures if he has broken its conditions, and then only by the superior agent

of his employers. Moreover, if there is reason to suppose that in dismissing a man an arbitrary act has been committed, the County Court will protect the man's rights. Surely, this is a better arrangement than the old one, and worthy of being described as beneficial to all parties.

The most recent example of this class of agreement—if we except that of The Gaslight and Coke Company, which is not yet settled—is that of the Norwich station of the British Gaslight Company. The terms of this agreement, which has been accepted, we understand, by all but about half-a-dozen of the men concerned, will be found in another column. Under it the men engaged for different periods of service; which they gladly did, notwithstanding the protests of the local Union officials about the inequity of the arrangement, which cuts the ground from under their feet. Nobody supposes that the Union likes these agreements; but in the circumstances it will have to "do "the other thing," as the phrase goes. The Union, both in London and the provinces, has lost its power to terrify working men out of their means of living; and if the contentment of the men under their new agreements is a prelude to their dispensing altogether with the parasites whose living is lost when they are satisfied, the deprivation will have to be borne. Of course, the old method of misrepresentation is being employed to prevent the men from signing these agreements, which will, as they are told, enable their employers to cut down their wages while they remain helpless. All these lies require to be exposed, even though the men are not likely to believe them. They know perfectly well that any right and advantage enjoyed by them without a long engagement will be confirmed by the offered agreements; and, further, that under their terms they will exchange the mischievous ability to jeopardize the gas supply of their town by leaving their employment at a busy season, for a certainty of position which they have hitherto lacked. If Gas Managers do not take advantage of the present opportunity for making the lighting of their districts secure, they must not expect more sympathy than is accorded to the Foolish Virgins of the parable.

Elsewhere also we give the latest particulars as to the condition of affairs with The Gaslight and Coke Company and their men. It is now in the last degree unlikely that any serious disturbance will grow out of the recent difficulty with the Beckton stokers; and in all probability a form of agreement will be settled that will be accepted as satisfactory to both parties. The vagueness of the second paragraph of the original Directors' draft, which the men regarded as leaving too many loopholes for their dismissal, is to be removed. It will be a source of great congratulation if this business is fairly settled, as, according to Mr. Trewby's statement, it will shortly be.

Abroad, the strikers do not find Gas Companies easier nuts to crack than those of this country. The Hamburg strike has ended disastrously for the men, whose places were very soon filled by other, and it is to be hoped steadier, hands. In Paris, the same thing has happened, although in a quieter way. There is generally an airiness about French newspaper reports of matters of this kind which, with the euphemism that seems inseparable from the language, renders it difficult to grapple with the facts. At any rate it appears that the Paris Gas Company have dealt summarily with their recalcitrant hands, and struck 150 of them off the roll *pour encourager les autres*. Neither Germans nor French exercise much judgment in coming out on strike against a Gas Company in the height of summer. The British stoker, foolish as he is to strike at all, chooses a more promising season for his venture. The truth is that gas workers everywhere require to learn that their employment is not one that favours striking. They appear to think that a worker is a worker, wherever he may be employed; and that the method of putting pressure upon employers suitable for a waggon-factory will suit gas stokers equally well. They must be taught, however, that there are services in which those engaged are practically as deeply bound to act faithfully as are soldiers and sailors. The military and naval services are, after all, only a branch of the national defences. There are others, almost equally important in their way, upon the faithful performance of which the safety and health of the community depend. These public services are not to be paralyzed by disputes about wages and other incidental questions, just as workmen by striking may stop a mere commercial business. The general public as a body perceive this distinction; and hence their indifference to gas stokers' appeals for help and sympathy in striking. For every reason, therefore, Gas Managers owe it to the public, to their employers, and to the men themselves, that there shall be no repetition of last winter's terror in the gas-works of the United Kingdom.

The Chartered and South Metropolitan Arbitration.

THE claim of The Gaslight and Coke Company against the South Metropolitan Gas Company for damages consequent upon the judgment of the House of Lords in the celebrated districting case came last Thursday before the Arbitrator agreed upon by the parties—Mr. H. E. Jones, M. Inst. C.E., the Engineer of the Commercial Gas Company. The point at issue, which Mr. Jones has to determine, is the amount of money loss sustained by the plaintiffs, The Gaslight and Coke Company, through their having been deprived by the South Metropolitan Company of the sale of the gross quantity of gas which the London and South-Western Railway Company illegally, as the judgment in the case went, obtained from the defendant Company. We shall probably publish a report of the proceedings later on; but, for the present, may summarize their character by stating that soon after the commencement of the speech of Mr. Danckwerts, who represented the plaintiffs, it appeared that there would be fundamental differences between the parties respecting the principles and methods of computing the amount of the damages. The claim of The Gaslight and Coke Company is for £7530; being the value of 101,881,000 cubic feet of gas (quantity agreed upon), calculated at 1s. 5·7d. per 1000 cubic feet, the alleged profit which the Company would have made if they had had the sale of this quantity of gas to the Railway Company, taking the gross cost of the gas at 11·08d. per 1000 cubic feet. The plaintiffs went into great detail of accounts in order to make a special estimate of the cost at which they could have manufactured the quantity of gas in question, and made it extremely low. The other side (represented for the occasion by Mr. Mark Knowles) objected to this specialized way of calculating the amount, which left out a good many fixed and ordinary charges, and argued that the sum should be settled with reference to the general data ascertainable from the figures of the plaintiff Company's accounts—that, in short, all the Arbitrator had to do was to work a rule-of-three sum from published figures, showing the plaintiff Company's revenue and expenditure. Our readers must be left to judge for themselves, for the present, between these contentions; but it should be remarked that nobody following the proceedings would have imagined them to bear out the promise of mutual good feeling shadowed forth at the last meeting of The Gaslight and Coke Company. When the speech of Mr. Danckwerts and the evidence of Mr. John Field, the Company's Accountant, are read, it will be strange if the leading case of *Shylock v. Antonio* does not occur to mind. Moreover, Mr. Danckwerts warned the Arbitrator that if he objected to any point of principle in the plaintiffs' statement of claim, it would not be for him to correct it, but only to report upon the matter, in order that "the Court" might decide upon it. The pleasant prospect of endless litigation thus held out will doubtless please the shareholders of The Gaslight and Coke Company, now that they have so many other heavy charges to bear. Besides, how would the arguments in this arbitration read in a rating case? At the close of the day's hearing, the proceedings were adjourned till next Saturday.

The Impending Fall in Coal Prices.

THERE are already indications that coal prices are giving way in several distinct parts of the kingdom; and therefore those Gas Companies that have held out against the combination of coal-owners and the inflated state of the market, will in all probability soon have the advantage of such of their compeers as have made contracts at top prices. Of course, a desperate struggle will be made for a few weeks to check the inevitable tumble, or at least to postpone it until most of the large gas coal purchases for the year have been concluded; but such efforts must be futile. The reason for this conviction lies on the surface. It is universally admitted that the iron market has gone to pieces. After a phenomenal gamble, the reaction has set in; and iron manufacturers are now accumulating stocks at an extremely uncomfortable rate for themselves. The

price of oven coke has gone down to one-half the highest rate of the past winter, and will probably fall lower. In these circumstances, how is the value of coal to be maintained? If the great coal and iron companies cannot go on making and selling iron, they must part with their coal; and, as a matter of fact, several sellers who a week or so ago were most exultant over the prospect of having a good turn at last, are approaching buyers and offering supplies at a marked reduction. They cannot help themselves. In a normal condition of trade, at least 40 per cent. of the gross coal output of the country goes in the iron manufacture. When the iron trade is very brisk, as it has lately been, a sensible additional quantity of coal is drafted into the iron-works, which makes coal scarce elsewhere. The slightest check in the demand for iron in any of its merchantable forms is quickly felt in a reduced demand for fuel; and so the wheels go round. No combination among coal-owners, who are so often iron-masters also, can hold good for long after the market turns against them. They will talk very big about their rights, and their determination to enforce them; but this confidence only lasts while the market is rising, and when any combination that can hold together for a week or two must make matters better for them. So soon as things begin to appear queer, each looks out for evidence of the other giving way; and so, at the first disquieting rumour, the portentous combination dissolves into a swarm of mutually destructive individuals. When the coal-owners touch bottom again, nobody will pity them. Some, who have managed to secure good contracts while the "boom" has lasted, will not look for commiseration. What has specially enraged purchasers of coal during the past few months is the unreasonableness of the advances asked and insisted upon in some deplorable instances. A moderate increase of price, as we have all along contended, would have been paid without much grumbling; but the coal-owners wanted to recoup all their past losses at one stroke, and have over-reached themselves in the attempt. If some Gas Companies had not hurried forward their contracts, thereby playing into the hands of the coal-owners, the downward movement would have set in earlier; but it will now in all probability be general and irresistible, if not rapid.

Mr. Alfred Lass, F.C.A., leaves England by the mail this week for the Cape, on a professional engagement. He is expected to be away about two months; but, of course, his absence will not in any way interfere with the business of the firm, which will have the attention of his partner (Mr. Samuel Wood).

The Management of the Lymm Gas-Works.—There were upwards of 80 applications for the post of Manager of the Lymm Local Board Gas-Works (advertised in the JOURNAL a fortnight ago), in succession to Mr. A. Graham, who goes to Hebden Bridge. These were reduced to five, and finally Mr. W. Severs, of the Crossgates Gas-Works, Leeds, was appointed.

The French "Otto" Gas-Engine Patents.—The French Cour de Cassation has just decided against the native holders of the "Otto" gas-engine patents in an action for infringement, on the ground that the employment of the same scientific principles, with differences in the method of application, is not an infringement of the rights of the first person to apply such a principle in practice.

The Recent Strike of Gas Stokers in Paris.—Our readers may remember that last month opened with a strike of the stokers of the Paris Gas Company. It was brought to an end by the acceptance of the concessions offered by the Company, particulars of which have been given in the JOURNAL; but the result of the movement has been that 150 of the leaders have been struck off the Company's books.

Adoption of Inclined Retorts at Beckton.—The Gaslight and Coke Company are about to adopt inclined retorts at their Beckton works. The Company's Engineer-in-Chief (Mr. G. C. Trewby) has devised an arrangement for facilitating the charging of the retorts, whereby they can be set at a greater angle, and consequently the coke discharged more easily, than on the Coze plan. A retort on Mr. Trewby's improved system has been in operation day and night at Beckton for upwards of two months, working five charges in 24 hours. It is 15 feet long, and set at an angle of 40°. The success attending it has led Mr. Trewby to recommend the Directors to erect 16 settings of nine retorts each, making 144 mouthpieces, in one of the old houses where the arches have to be reconstructed. The recommendation has been adopted; and the retorts are expected to be ready for work by next winter. The charging machinery is being made by Mr. J. Ruscoe, of Hyde, near Manchester.

WATER AND SANITARY AFFAIRS.

DURING the past week three of the London Water Companies have held their half-yearly meetings. As usual on such occasions, there is very little discussion; and nearly all the speaking proceeds from the Chairman. Dividends remained as before; each Company having experience of an increased income in connection with increased expenses. There was a reference on all sides to the rise in the price of coal. Sir W. H. Wyatt, who presided at the Chelsea Company's meeting, believed that had it not been for the coal, the shareholders might have received another ¼ per cent. dividend. Alderman Sir H. E. Knight, the Chairman of the Southwark and Vauxhall Company, stated that the rise of £1000 in the charge for maintenance, as compared with the corresponding period of last year, was chiefly owing to the advanced price of coal, though a portion of their increased expenditure was due to other causes, of a transitory nature. Mr. E. G. Fox, presiding over the meeting of the Grand Junction Company, stated that they had been obliged to pay £970 more for coal in the past half year than previously. Mr. Fox specified also an increase of £365 in taxes. Unexpected burdens thus tell upon the Water Companies, and prevent those overflowing profits which are popularly attributed to their finances. At all the meetings, allusion was made to Mr. Causton's Bill for restricting the charge for water. But the actual terms of the measure were not open to criticism, as the Bill had not been printed. The second reading is fixed for the day after to-morrow, allowing therefore of little time for a consideration of the provisions contained in the Bill—a circumstance which may be of no great consequence, as the general impression is that the project is impracticable, standing as it does in defiance of those Acts of Parliament on which the enterprise of the Companies has been based. If, as Sir W. H. Wyatt remarked concerning the Bill, "nothing can come "of it this session," it may as well be laid on the shelf till the approach of another quinquennial valuation. But the Companies are wise to be on the alert; and a combined effort is being entered upon, so as to prevent a surprise.

Very little was said at the meetings with reference to the Corporation "inquiry" into the subject of the water supply. At present, nobody seems to care very much as to the proceedings of the Guildhall Committee. On Friday last, one of the witnesses, who has the honour of being both a member of the Corporation and of the London County Council, said he would give his evidence "with "much more satisfaction" if a representative of the Companies were present. The attitude of calm unconcern thus manifested with regard to the investigation set on foot by the Corporation Committee is perhaps a little annoying. But the only Company immediately interested is that of the New River; and the fate of past negotiations between this Company and the Corporation seems to show that there is very little to be gained by the two parties coming together. As for the other Companies, perhaps they share the feeling expressed last Thursday by the Chairman at the Chelsea Company's meeting, who said he did not see how the City inquiry could affect them, as "they did "not serve the City." Yet it is evident that the principle which is most sedulously attacked by the Committee at the Guildhall is that of charging for the water supply in proportion to the rateable value of the premises; and this is a question which concerns all the Companies. As affecting London generally, and as bearing more especially on the interests of the consumers, there was one piece of evidence given at the Guildhall on Friday, which, although not new, is perhaps not sufficiently known or remembered. Mr. S. Wood, of the firm of Messrs. Alfred Lass and Co., stated that if the undertakings of the Metropolitan Water Companies had been brought up in 1880 on the terms arranged by Mr. E. J. Smith, the purchasing authority would have made a net gain of at least £15,000 in the ensuing five years. It is curious that in 1870, when Mr. Hora brought forward a motion in the Court of Common Council, advocating the taking over of the water supply by the Corporation, the proposal was rejected. Mr. Hora believes "it was a calamity to the "citizens of London that the resolution was not acted "upon." So much for the wisdom of the Corporation. A few years later, and Parliament made the same blunder. We fear the water question in London is not properly understood even yet.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1138.)

THE tendency of nearly all departments of the Stock Exchange during the past week has been downward. At the opening, there was some show of steadiness; but a weaker turn rapidly set in. A variety of circumstances tended to produce this movement, chief among which were a decided scarcity of money, apprehension of a further drain of gold, a renewal of financial troubles in South America, and a hitch in the Silver Bill of the United States. Generally, too, profits were realized where there had been a recent rise. The Gas Market was moderately active, and very steady. Gaslight "A" still keeps up. It rose 1 more on Monday. But this was too much to be maintained; and it fell back the next day. The demand for the stock which sent it up in the preceding week, was probably based upon some exceptional causes; and though not large, it had its influence—stock being scarce. Business on Saturday was marked at 250, with no immediate prospect of a fall in value. The secured issues have been active; and good prices have been realized for all that were dealt in. The debenture stocks, now quoted *ex div.*, show considerable variation in value; the 6 per cent. stock being priced to return ¼ per cent. more interest for money than the 4 per cent. stock. Quiet business, at good steady figures, has been done in South Metropolitan "B;" but the other issues have not been touched. The only record for Commercials is a deal in the new, at top price. Suburbans and Provincials are again quite featureless; and a couple of dealings at fair figures in British comprise the whole business effected in them. Some of the Foreign undertakings continue to advance. Imperial Continental is in demand, at higher prices; and 220½ has been fetched several times. Bombay is ¼ higher. Buenos Ayres and Monte Video were slightly checked at first by the prospect of another financial difficulty in Argentina; but an improvement in the outlook has brought a quieter feeling. Water stocks have been extremely quiet, but firm. Several issues show higher prices upon *ex div.* adjustments, especially Chelsea.

The daily operations were: Gas opened firm on Monday, and was fairly active. Gaslight "A" advanced 1; Imperial Continental, 1½; and good prices generally were realized for every issue dealt in. Water was steady and unchanged. Business in Gas on Tuesday was much about the same; but Gaslight "A" lost the advance it had made the day before. Bombay rose ¼. Water was quiet again, but not less firm. Chelsea improved 1. There was no noticeable movement in Gas on Wednesday; the market being steady and quiet. Nothing at all was done in Water. Gas still showed out very firm on Thursday. Gaslight secured issues were in demand; and Imperial Continental was bought at higher figures—the quotation advancing £1 more. Continental Union, £14 paid, also rose 1. Water was again quite stagnant. Friday's business in the Gas Market was somewhat quieter. But there was no abatement in price; and several water stocks, quoted *ex div.*, were higher, though not dealt in. On Saturday, Gas showed undiminished strength all round. Water was an absolute blank.

ELECTRIC LIGHTING MEMORANDA.

Electric Lighting only a Question of Copper—Improvement Renders Electric Lighting Dearer—The Nature of the Lane-Fox Claims.

ACCORDING to the last reports, the question of profitable electrical distribution is being reduced more and more to a problem of copper. All high-pressure systems involving the use of insulated mains are more or less calculated to solve the difficulty of distributing large quantities of electricity with the aid of a small weight of copper. In some places where this attempt has been made, the failure of all known methods of insulation to keep electro-motive energy of high potential within the mains intended to convey it, has resulted in the full acceptance by the undertakers of the alternative of spending a large proportion of their capital in copper. Thus, for example, it has been found that in Berlin a most costly insulated high-pressure cable will not last more than three years; from which it follows that no electric lighting company could expect to keep out of bankruptcy unless some other method of distribution was available. Consequently, most of the Berlin electric lighting is now done at a low potential, nowhere exceeding 120 volts; and the conductors are simply bars of the purest copper, varying from 30 to 900 square millimetres in section. These bars are carried on glass insulators in cement concrete channels formed under the side walks. The Company laid down 2000 tons of these bars last year, and are this year laying 3000 tons more. They expect to buy 80,000 tons of copper before the city is completely supplied with all the electric lamps it may be supposed to require. The Managers of the Company hold the opinion that this method of distribution is altogether the safest and most economical in the end, and that all attempts to avoid investing capital in copper will prove illusory. The significance of this statement, if borne out by experience, is very noteworthy. Copper costs at the present time something like £50 per ton; so that the expenditure for fitting Berlin with bar conductors will not be less than £4,000,000 for the raw metal alone, to say nothing of the cost of laying. The metal will not deteriorate for other uses if this fails, which is more than can be said of the costly insulating materials required for distributing-mains under other systems. All the same, the idea of having to lay a copper mine in the streets of every town where the electric light is to be permanently installed, is rather startling. If it will require four millions' worth of copper for equipping Berlin, what would be needed for London?

The subject of the preceding paragraph receives further enlightenment from a communication of the manager of one of the New York electric light companies relative to the cost of arc lamps when supplied from the now compulsory underground mains. This authority makes it appear that unless in this case the city government is prepared to pay about 30 per cent. more for arc lighting than was charged when the supply was by overhead wires, the electricians will find it impossible to do business. It is admitted here that the average life of an insulated cable for underground work is three years; but the Edison people are the only electric lighting company that accept the inevitable consequence, and put their money into copper bars. The others all want to do business without laying out so much capital, even if the game should not last. At this rate, however, it would appear that the notion that electric lighting is going to be cheapened by experience of its use, which has amused the public for some years, must not only be abandoned, but must be replaced by a belief in the direct contrary effect. At New York it is roundly stated that the temporary, makeshift fashions of electric light distribution which have been discredited on account of their danger to life and property, were far cheaper than the improved systems required for permanent installations. Formerly the price of an arc lamp in New York was 35 c. per night; now, with underground distribution, it cannot be done for less than 46 c., or a little more. When the city authorities are informed of this advance, however, their response is to return to gas, which, of course, is very hurtful to the feelings of the electricians, as well as damaging to their interests. The probability is that the authorities do not believe a word that the electricians, say about the extra cost of working underground wires, but think the latter are in a conspiracy to squeeze money out of the city in order to repay the expense incurred by them in obeying the ordinance requiring them to put the wires underground. The electricians assert that the progress of civilization will be stayed, and the place of the United States among the nations imperilled, if they do not get the money they are asking for lamplighting; but the New York city government remains impassive under the most eloquent denunciations of the sinfulness and barbarity of gas lighting.

It appears that when, writing from borrowed information, we described, on the 3rd inst., the claim of Mr. Lane-Fox as being for an anticipation of "the fundamental method of using alternating transformers" in electrical distribution, we committed an error. Mr. Charles A. Stephenson, the Managing Director of the Lane-Fox Electrical Company, Limited, writes to correct us; stating that the system invented by Mr. Lane-Fox, and described in a patent specification dated Oct. 9, 1878, and in subsequent patents, is for "a system of distribution in parallel arc in conjunction with secondary batteries as reservoirs of electricity." Mr. Stephenson's communication, the substance of which we have now given, is accompanied by a collection of reports on the validity and importance of Mr. Lane-Fox's patented electrical inventions which we cannot reproduce. He is supported by Sir William Thomson, Professors Perry and Silvanus Thompson, Mr. Latimer Clark, and Mr. W. H. Preece. A respectable collection of authorities, doubtless; but probably as many, or more, could be ranged on the opposing side, for a sufficient consideration. Mr. Lane-Fox has a very big thing in hand, in attempting to procure respect for his alleged claims by force of law; and it may be permissible to wish him well through with his enterprise, without venturing to usurp the prerogative of the interpreters of the law, and express any opinion regarding his prospects. At all events, for a certain amount of money contributed by both sides, the Court where the case is to be heard will be converted for the nonce into an interesting electrical museum, where object lessons in electric lighting will be given by eminent authorities, more or less to the instruction of the Judge and the edification of the electrical world at large, which has not hitherto inscribed the name of Lane-Fox among those of its most eminent and successful leaders.

Society of Chemical Industry.—On the occasion of the annual general meeting of this Society, which will be held at Nottingham on the 9th, 10th, and 11th prox., the members will visit the Corporation Gas-Works.

Electric Lighting by Gas Companies in America.—According to "Brown's Gas Directory" for the present year, the number of gas companies working electric light undertakings in America is 304, as compared with 266 at the time the book was published last year. The number of electric light systems used is 23—being an increase of two; the number of arc lights supplied is 31,558, against 21,313; and of incandescent lights, 132,771, against 55,890.

DISPLAY OF THE AUTOMATIC SYSTEM OF CHARGING AND DRAWING GAS-RETORTS BY GRAVITATION.

After a time spent in tentative experiments (which, although it may seem long to those who have heard little or nothing of the Coze system since its success at Rheims was reported, yet, after all, is not excessive when the slow character of retort-house work is remembered), the first actual working setting of inclined retorts in England was exhibited in operation at Southall last Friday to a party of visitors from London. One of the first of English gas engineers to take the Coze system in hand with serious intent was Mr. Morris, of the Brentford Gas Company, who made arrangements some months ago with M. Coze to erect a couple of settings at the Southall works, wholly from the French engineer's designs, and with material as supplied to him at Rheims. Yet the working setting which was shown on Friday was not M. Coze's design, but the modification thereof invented by Mr. Morris and his assistant at Southall, Mr. Van Vestrant, and adopted by the larger Company in which the original Syndicate that imported the French system is now merged, while a couple of Coze settings are still awaiting completion beside their more modern and—if M. Coze will pardon our saying so—more practical development. The reason for this delay in the completion of the older pattern arrangement is illustrative of the difference between the two designs. In the Coze system the retorts are of special make; being of a bottle-necked ⌂ shape; the height of the retort in the clear being reduced near the lower mouthpiece, in order that the low crown should operate in checking the fall of large lumps of coal which it has been supposed by the inventor might otherwise descend with too great impetus, and lodge against the mouthpiece. Then the mouthpieces themselves are of a special pattern, very large and heavy; and the "duckfoot" bends at the top of the retorts, which first receive the charge as it is dropped from the charging-shoots, require very accurate centring. In short, the whole device, as carried out by the French designers and manufacturers, has to an English eye a certain pedantic aspect—correct, of course, but involving several niceties of adjustment, and perhaps also of working, which jar somewhat on one's habitudes in regard to carbonizing work. Actually, so far as the Southall experiment is concerned, the result has been to keep Mr. Morris waiting for the requisite materials, delayed in transit by a variety of untoward incidents and accidents, until long after the simple development devised by him and Mr. Van Vestrant with materials at hand had been carried out.

For the essential difference of the Morris and Van Vestrant arrangement from that of M. Coze consists in the elimination from the former of all special sections of retorts, mouthpiece castings, and other complications (such as iron bends buried out of reach in the brickwork), and applying the principle of charging and drawing by gravity to ordinary retorts set at the proper angle. The setting now on view at Southall consists of seven of the ordinary 21 in. by 13 in. ⌂ through clay retorts, as ordinarily used in the works, 20 feet long, with the usual self-sealing lids at each end, although only the lower mouthpieces are fitted with ascension-pipes. And here it should be said that these mouthpieces, from the lower end at least, are not the best that could have been desired for the work; the change of section from ⌂ to round acting as a check upon the discharge of the coke, and requiring more use of a light rake and slice to ease the charge away, than ought to be necessary for a truly automatic system. From this observation, it appears that M. Coze is right in insisting, as he does in his own original design, upon a mouthpiece at least as large as any cross section of the retort. The charging of these long retorts is effected by a travelling hopper closed at the bottom by a slide, which can be easily drawn out by means of a lever handle, when the whole 6 cwt. of coal required for the retort falls down through a travelling shoot, with a telescope adjustment for length, and a moveable shoe slung at the foot to guide the coal into the mouthpiece. This is Messrs. Morris and Van Vestrant's substitute for the built-in duckfoot bends of M. Coze; and it certainly appears to answer well. We can vouch for the fact of the equable distribution of the charge over the sole of the retort by this apparatus, and also for the comparative ease with which the men—evidently not trained stokers—did the whole of the work of drawing and charging. It would be wrong to assert that the work is capable of being done in the fashion the eminent Mr. John Burns once described as his manner of stoking gas-retorts—with waistcoat and collar on; but it is so much easier than ordinary hand stoking in that there is no tugging at heavy rakes, no lifting of coals, and no drill, as is essential for gangs working through retorts in the usual way. In a word, it is difficult to see why any ordinarily smart labourer could not pick up the work in a week at the outside. The practical problem of inclined retort working must be considered solved if what was shown at Southall last Friday can be repeated in regular working; and there is no reason why it it should not be improved rather than otherwise as the men become more accustomed to their duties.

The result of this Southall experiment is to prove that two men can draw and charge seven through retorts in 20 minutes from start to finish. If this is regarded as their regular hourly spell, it follows that the same men could do 56 such retorts in an eight-hour shift, or 77 retorts in the eleven turns of a twelve-hour shift. Taking the former case, however, as the least favourable, these two hands would carbonize 56 charges of 6 cwt., or 16 tons 16 cwt. of coal per shift. The ordinary horizontal retorts as worked at Southall require a gang of three stokers to do 72 mouthpieces per eight-hour shift, or, at 3 cwt. per mouthpiece, a total carbonizing duty of 10 tons 16 cwt. for the gang. Thus it is demonstrated that, by the new gravitation system, a man can carbonize 8 tons 8 cwt. of coal per shift; whereas by the ordinary system, according to the eight-hour London scale, he can only do 3 tons 12 cwt. per shift. The efficiency of the man is therefore increased under the new system by the ratio of 168 to 72, or as 7:3. Nor is this all; for whereas, under the ordinary system, the men have an interest in cutting down the weight of coal handled by them, in the new system they have none; and there is accordingly nothing to prevent the retorts and charges being enlarged to any practicable extent, because the unit of the man's labour is the number of mouthpieces he attends to, and not the weight of coal that falls down the shoot. The importance of this change of basis in estimating the stoker's labour can hardly be overrated.

It is unnecessary to enter into further details of the automatic gravitation charging system, which are by this time thoroughly familiar to our engineering readers. All we need say is that Friday's proceedings were completely successful, and fully demonstrated that the period of experiment has ended for this system, and that of commercial exploitation begun. It is no part of our duty to comment upon the manner in which this portion of the affair is being taken in hand. A Company is to be formed, of course—whether to pay a dividend or not is beside the question at present. The main thing for us to speak to is the way in which M. Coze's principle has been adapted to British conditions by Messrs. Morris and Van Vestrant; and as to this we have every confidence in recording a highly favourable judgment.

THE GAS-STOVE DEPARTMENT OF THE GASLIGHT AND COKE COMPANY.

For some time past The Gaslight and Coke Company have been seeking to extend their business by making known to the consumers in their extensive area of supply, through the medium of free lectures, the benefits to be secured from an intelligent use of gas-cooking and heating stoves; and the results which have followed have greatly exceeded the expectations of those who govern this department of the Company's operations. Up to the present time the Company have issued no less than 25,000 stoves of various kinds, 20,000 of which are out on hire, and 5000 have been purchased by the consumers. These figures will, no doubt, somewhat amaze the managers of gas-works in many provincial towns; but the returns as to the number of stoves sent out in the last two months will perhaps prove even more astonishing. In April, 1684 stoves were supplied to consumers; a total of 2608 was reached in May; while during the past fortnight the increase has been 653. The mean monthly growth is now about 2000. The Company fix these stoves free of charge; the average cost of the fittings and labour being within a few pence of 11s.

Reverting to the subject of the cookery lectures, the Company's area is separated into three divisions—known as the Central, Western, and Northern; and these, for the purposes of the cookery demonstrations, are confided respectively to the care of Madame Alting-Mees (who commences to-day a course of lectures at Highbury), Miss Cameron, and Mrs. Wilkinson, all of whom are worthy exponents of the culinary art. Halls are engaged for these ladies for fortnightly periods, and they are fitted with gas-stoves and the necessary kitchen utensils for illustrating the lectures; while arranged round the buildings are samples of all kinds of gas appliances for domestic use, the manipulation of which is explicitly explained by competent attendants at the close of the evening lectures. These lectures (which are delivered twice daily) are well advertised; and each one is based on a subject bearing an attractive title. For example, Madame Alting-Mees during the first week of the current month dilated on "The Uses and Abuses of the Gas Cooker," "Gas as a Domestic Servant," and "The Hygienic Side of Cooking by Gas." Convincing answers were also given by her to the inquiries "What will Ten Feet of Gas Cook?" and "Is Gas Healthy to Cook with?" and (to her own satisfaction) she disposed of the much-agitated problem, "What shall we do with our Daughters?" These lectures are an unfailing source of interest throughout the three districts; and it is proposed to continue them during the year, so long as suitable halls can be hired for the purpose.

On the suggestion of Mr. G. F. L. Foulger, who is the responsible chief of the distribution department; the Company have within the past few weeks, struck out a new line of action. Hitherto, most gas companies have been very chary as to entering the dwellings of the consumers; but Mr. Foulger contends that past experience amply shows that it is not politic to leave the internal arrangements entirely in the hands of gas-fitters who have not the slightest interest in the matter after the fittings are up. Of this he has succeeded in convincing the

Directors; and they are now prepared, without any wish to trespass unduly on what are regarded as the preserves of gas-fitters, to undertake the fitting up of any house. To further this policy, a few days since there was opened, at the City Offices of the Company in the Goswell Road, a commodious show-room, where intending consumers of gas can see in operation gas-burners of all classes, from regenerative down to the common flat-flame; and stoves of every description, from a highly ornamented drawing-room stove to a simple contrivance for heating tailors' irons. A room similar to this is about to be provided at the Horseferry Road station; and when these have had a fair trial, it may be thought desirable to fit up others in different quarters of the Company's district. Mr. W. C. Wigley, who has for many years been head of the meter department, has been deputed to manage the stove portion of the business, which, as shown above, has already become a highly important branch.

The show-room at Goswell Road is well worth a visit. Everything has been arranged with an eye to effect. The cooking-stoves are placed round the sides of the room on little raised tiled platforms, and all are fitted with a supply of gas. In this class of goods are shown the latest and most approved types of the manufactures of Messrs. H. and C. Davis, Messrs. W. Sugg and Co., Limited, Messrs. T. Fletcher and Co., Messrs. J. Wright and Co., Messrs. S. Leoni and Co., Messrs. R. and A. Main, Messrs. C. Wilson and Co., Messrs. Yates, Haywood, and Co., and the Carron Iron Company. Nearly all these firms are also represented by heating stoves, which are so well known to the larger number of our readers as not to need description here; but, in addition, there are on view specimens of the Leeds downward radiating stove, Cox's patent ventilating stove, Ritchie's "Lux Calor" hygienic condensing gas or oil stove, and Messrs. Pardoe and Sons' asbestos fuel gas-fires. Down the centre of the apartment is a long counter, with tiled top; and on this are displayed hot-plates, grillers, and small heating appliances for domestic and industrial use—all having a gas supply attached. Visitors to the show-room may not only see the actual working of the cooking-stoves, but, following out the old adage that "the proof of the pudding is in the eating," may make practical trial of small loaves of bread and pastries baked by the stoves. These little examples of what the stoves are able to accomplish look very inviting. They are laid out on a table covered with a white cloth; and plates and chairs are carefully kept in readiness—each likely customer being tempted in turn to eat and judge for himself. This is found to be a very effectual way of satisfying visitors as to what the stoves are capable of doing; and gas companies who have opened, or are contemplating opening, a room with similar objects in view would find it advantageous to take a hint from this. A special feature of the room is a bath fitted with one of Messrs. Ewart and Son's "Lightning" geysers, in which provision is made for ventilation. A small lavatory has also been constructed, with a very simple arrangement, patented by Mr. T. Fletcher, for providing a supply of hot water immediately it is required. The well-known "Therma" water-heater of Messrs. Sugg and Co. is also on view. The collection of appliances is not at present quite so complete as it is proposed that it shall be. It is intended to exhibit, if possible, every form of burner and stove of merit in the market; and then the Company's customers will be able to compare side by side their respective capabilities.

Mr. J. Swan, Manager of the Ulverston Local Board Gas and Water Works, has been granted an increase of £25 a year in his salary, in consideration of the additional work which has devolved upon him since his appointment. Mr. Swan's annual report was noticed in the JOURNAL a fortnight ago; and when it came before the Local Board, he was complimented on his economical and successful working. It may be mentioned that the higher salary Mr. Swan will now receive is only equal to what was paid to his predecessor thirteen years ago.

Iron and Steel Institute.—The programme for the forthcoming visit of the members of the Iron and Steel Institute to the United States has been issued. There will be three different sets of meetings—the first, the meetings of the American Institute of Mining Engineers, which take place in New York on the 29th and 30th of September; the meetings of the Iron and Steel Institute, which take place in the same city on the 1st, 2nd, and 3rd of October; and the international meeting promoted jointly by those two Institutes, which will take place about the middle of October at Pittsburg. The excursions which have been planned by the American Reception Committee, of which Mr. A. Carnegie is Chairman, provide for about 3000 miles of free transportation through the United States. The principal excursions will be to the iron ore and copper regions of Lake Superior, to Philadelphia, Harrisburg, and Chicago, where there are large iron and steel engineering works to be inspected, and to the new iron-making district of Alabama, which has lately come prominently to the front, and in which English capital has become very largely interested. The meetings and excursions will last altogether more than a month, and will practically embrace every point of interest in the United States within a distance of 1500 miles of New York. A number of important papers have been promised for the meetings by such well-known scientists as Sir Lowthian Bell, Sir N. Barnaby (late Chief Constructor to the Navy), and Sir H. Roscoe.

NOTES.

Economizing Heat in Retort-Settings.

At the Paris Exhibition last year, there was shown an appliance devised by M. Wery for consuming smoke and economizing heat. It has been favourably noticed in the *Journal des Usines à Gaz* by M. Brémond, who considers that its application to gas-retort furnaces will result in a great saving of fuel. The principle embodied in the apparatus is that of the Giffard injector, whereby a certain quantity of relatively cold air is caused to pass into the chimney-shaft through a circular orifice, reduced in section as much as possible, and proportional to the chimney; thus surrounding the hot furnace gases in motion, mixing with them, lowering their temperature, and diminishing their velocity. By the use of the apparatus an intermittent draught is created in the chimney; and the products of combustion are driven back into the furnace when the damper is closed. It acts without motive power of any kind, and can be applied to existing chimneys; but the most convenient plan is to construct a brick foundation, and place the appliance on it surrounded by a sheet-iron chimney. A Wery apparatus and chimney, of a total height of 30 feet, the chimney being 11 inches in diameter, were substituted in one gas-works for a brick chimney 62 feet high, and 35½ inches in diameter at the base; and its action showed clearly that large chimneys such as are now erected are unnecessary—no flames being found to issue from the top. At these works, where the dampers are closed every evening and the furnace started again the following morning, the heat is maintained, and the furnace regains its ordinary temperature in half the usual time. Coupled with these advantages is economy of fuel; a saving of something like 16 per cent. having been realized at a time of intermittant working. With the furnace in regular operation night as well as day, no doubt greater economy would be effected, especially as the apparatus works best when the outside temperature is low. In a trial extending over twelve days in the month of November, there was a saving of 28 per cent. of fuel as compared with the corresponding month in the previous year. The apparatus is of simple construction, and requires only occasional cleaning when coal or tar is employed as fuel.

The Mackenzie Gas Process.

A good deal of advertisement has been devoted in America to the popularization of the Mackenzie gas process, which is actually in use for the supply of Garden City, Long Island. The peculiarity of the apparatus is in the generator, which is a wrought-iron cylinder, about two diameters high, lined with fire-brick in the usual way. The lower portion of the vessel is fitted with refractory chequer-work; and the blast is admitted near the top, by two nozzles placed opposite to each other, and so formed in solid fire-blocks as to enter the generator in a direction tangential to its inside circumference. Below the blower nozzles is a small cylinder fitted with a number of perforated metal plates, upon which naphtha is allowed to drop. It is a feature of the apparatus that no solid fuel is used in the gas making; naphtha alone being employed. The naphtha appears to be burnt first with an air-blast to heat up the chequer-work to the requisite temperature for gas making; and then more naphtha, with steam separately generated, is passed through the vessel. What the advantages of this system of working are, cannot be expressly declared. The vortex disposition of the blast is preserved in all the varieties of the Mackenzie generators, which vary in some respects according as they are required for producing illuminating gas only, or fuel gas, or either description of gas alternately. Naphtha seems to be the fuel and gas-making material used for choice in the Mackenzie process; but other kinds of liquid hydrocarbon are reported to be suitable under certain conditions.

A Simple Oil-Gas Generator.

Mr. F. W. Boam, F.C.S., has described in the *Chemical News* a simple home-made oil-gas apparatus, for use in laboratories where ordinary coal gas is not obtainable. He remarks that the usual laboratory appliances for producing gas from benzene, methylated spirit, &c., are frequently cumbersome, require constant attention, or are complete failures. His own arrangement illustrates how easily illuminating gas may be made from mineral oil. It consists of a small iron stove through the body of which is passed, in a slightly inclined position, a piece of 1½-inch or 2-inch iron steam pipe. At the upper end of this pipe is fitted a T-piece, closed on the outside with a plug, and with a small outlet (say ⅛ inch) looking upwards, to which is screwed a vertical oil-supply pipe having a syphon bend formed in it to act as a seal. The upper end of this oil-pipe is widened out to admit the end of the oil funnel; and in the side of this mouthpiece is an air inlet. The lower end of the retort-pipe is closed with a cross-piece, providing for a sealed outlet for surplus oil, a plug-hole for cleaning out the pipe when required, and a gas ascension-pipe leading to the gasholder. The management of the apparatus is obvious. The stove is lighted, and then the oil is admitted and gasified in the hot pipe. A little peculiarity in the arrangement is that by means of the disposition of oil-feed adopted by Mr. Boam—whereby oil is dropped from a funnel into a bulbous end of the supply-pipe, which is closed except for an air inlet at the side—every drop of oil as

it falls carries down with it a bubble of air, which passes with the oil into the retort, and the resultant product is not pure oil gas but partly carburetted air. The proportion of air may be varied at will, or stopped. It may be suggested that the gas made in this simple apparatus would probably be improved by passing through a second pipe placed alongside or above the first in the stove, in which the gas would be more effectually fixed than is possible in a single retort.

Cause of the Blue Flame Produced by Salt on Burning Coke.

The formation of the well-known blue flame which appears when common salt is thrown upon a coke fire has been explained in various ways. The latest explanation offered of this phenomenon is by M. Salet, in a communication to the *Bulletin* of the Parisian Chemical Society. M. Salet finds all previous interpretations of this appearance to rest upon inadmissible hypotheses, and he has accordingly examined the blue flame with the spectroscope, with the result that the coloration is found to be due to traces of copper present in the fuel. The spectrum of the flame shows the characteristic bands of chloride of copper, which is thus apparently instantaneously formed when salt is brought into contact with the incandescent fuel. Although the blue flame of chloride of copper is thus easily produced from a fire of coke, it does not follow that the mineral copper is present in the original coal in any but the most infinitesimal proportions. The method of spectrum analysis, employed for its detection by M. Salet is of extreme delicacy. Copper, on the other hand, is one of the most widely distributed elements, occurring as a trace in many kinds of vegetation; whence it may persist in the altered form of vegetable matter known as coal.

The Crossing of the River Weaver by the Vyrnwy Aqueduct.

One of the heaviest undertakings in main laying ever accomplished in this or any other country is the line of pipe aqueduct from the Vyrnwy to Liverpool. This is ultimately to comprise a triple line of 42-inch pipe; but only one line is actually being laid, except at the Weaver crossing, where all three have been laid at one operation, to save future interference with the channel. The river is crossed by three 32-inch riveted steel pipes ⅜-inch thick; the flange joints being made with an india-rubber ring and a washer of 7-lb. milled lead, secured with 1¼-inch compressed fluid steel bolts. At the point where the mains cross, the channel is 100 feet wide and 15 feet deep; and the pipes had to be laid at a depth of 21 feet. Accordingly a trench was excavated, chiefly by grabs worked by steam cranes on barges, and the ends sheet-piled so as to receive the ends of the pipes in little docks. These were manufactured at Warrington, by the Pearson and Knowles Coal and Iron Company. The three lines of piping, 108 feet long, were connected together with collars and plates; and, in addition, a rectangular cast-iron frame was fastened near to each end for a temporary purpose to be presently described. The trench being ready and the pipes floated into position over it, their ends covered by temporary blank flanges, and slung by chains over four winches, water was admitted in sufficient quantity to slowly sink them into their final place. The process of sinking only occupied 15 minutes. The pipes being thus laid, the next step was to drive sheet piling against the temporary cast-iron frames already mentioned, cover the pipes with concrete, and generally make good the river bed and bank. The sheet piling thus kept out the water of the river, and enabled the little docks in which the ends of the pipes lay to be pumped clear for making the shore connections.

Mr. J. T. Dennett, Chairman of the Cranbrook Gas Company, has just passed away at the advanced age of 84. The deceased gentleman, who held a number of public offices, was deservedly held in high esteem.

Mr. Charles Gandon, M. Inst. C.E., Engineer of the Crystal Palace District Gas Company, who has been spending a period of relaxation from duties in Smyrna, where his son (Mr. John Gandon) holds the appointment of Engineer of the Ottoman Gas Company, has returned to England very much benefited in health.

Water-Works in India.—According to a paragraph which appeared in a recent number of the *Calcutta Englishman*, the inhabitants of the ancient city of Agra will shortly have a pure and abundant water supply. The works are designed to give a supply of 1½ million gallons per day; and about 15 miles of mains and branches are to be laid in the most densely-populated parts of the town. A filtering station has been made, comprising three settling-tanks, four filters, filtered water reservoir to hold 1½ million gallons, engine-houses, boiler-houses, and all the necessary piping. The pumping and distributing engines and filtering station are situated near the bank of the River Jumna, whence the water will be pumped; and after being purified by agitation with metallic iron, through Anderson's patent revolving purifiers, by which the organic matter will be considerably reduced, it will pass to the settling-tanks, and thence to the filters for final filtration before being sent into the town. Active steps have been taken by Mr. Cameron, the Engineer for the Contractors (Messrs. Marillier and Edwards), to complete the contract before the prescribed time—May, 1891; and he hopes to have the works finished in November next.

COMMUNICATED ARTICLES.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

XLII.

Attention will now be directed to a few points in connection with the destructive distillation of materials for the generation of illuminating gas. At the time when the JOURNAL was started, the possible productive power of various kinds of coal was a prominent question. The demand for cheap gas was just beginning to show itself; and the necessity for meeting it directed the attention of gas engineers to the gas-producing powers, both as to quality and quantity, of various kinds of coal. There was a general desire for some sort of a standard by which the results obtained at any gas-works might be tested, and pronounced to be satisfactory or not so good as might be expected, as the case might be. It may at once be stated that this endeavour to set up a gas-works touchstone has never been realized. No one has been able to set a limit to the actual gas-producing properties of any sort of material capable of yielding this illuminant. So the only way of proceeding is by comparison. The results obtained must be compared with those realized in other works where the same kind of material is employed. In respect to coal, with the continual increase of the coal-gas industry a vast number of working statistics have gradually accumulated, so that the yield and quality of gas obtained from any kind of coal used to an important extent can be readily ascertained. By means of these statistics, it is easy to see if the results achieved at some particular works are up to the average or not. So long as they are equal to those obtained at other places under similar circumstances, no more can be reasonably expected. Whether or not further scientific research is likely to lead to any important improvement in yield or quality, upon the results already obtained, is of course an open question.

But in addition to the natural desire to know if we are successful in getting the best obtainable results from our material, there is another reason why gas engineers wish to have a reliable method of testing the materials at hand; and that is the commercial one. They want to be able to estimate the value of any new material submitted to them, and especially to be in a position to check the quality from time to time. Perhaps a cargo of material may yield inferior results as compared with those afforded by a previous consignment of the same kind. In the interest of all parties concerned, it is desirable to be able to arrive at a definite conclusion as to whether the quality is really at fault, or whether there is merely some defect in the method of treating it.

The very first number of the JOURNAL contained (p. 3) an article by Dr. Fyfe, in which the quantity of gas produced by several different kinds of coal, and the quality of the gas as shown by the durability of the flame, and the percentage of condensation by chlorine, are carefully recorded. Dr. Fyfe gave further results in subsequent volumes of the JOURNAL; but they are now only of interest from a historical point of view. The same number contained on page 13 an article on "Coal and its Products," by the late Mr. Alexander Wright, in which the chemical constitution of coal was dealt with, and also the value of various kinds in respect to the quantity, weight, specific gravity, and illuminating power of the gas yielded, and the amount of coke, tar, and liquor from each ton of material. He noticed the important fact that the coal which yields the largest quantity of gas does not necessarily give the best results; but that the weight of gas furnished is a better indication. In the second volume of the JOURNAL, we find the late Mr. Thos G. Barlow following on very similar lines; giving statistics as to working results obtained from several sorts of coal, including a mixture of three parts of Pelton with one part of Boghead. It is shown that these kinds of coal, distilled together in the proportions named, yielded better results than would be obtained by treating equal weights of them separately. Mr. Barlow also pointed out that the true criterion of the value of a gas coal is the amount of illuminating value afforded by it, which he arrived at by multiplying the quantity into the quality, and reducing the result to the equivalent in pounds of sperm. Attention was also directed in the same volume (p. 332), by the late Mr. Lewis Thompson and others, to the percentage of volatile matter, coke, ash, moisture, and sulphur, that were found, by analysis of a fair average sample, to be present in the coal, as well as to the specific gravity and other physical properties, in connection with their value to the manufacturers of gas. Dr. Fyfe's chlorine test has been discarded as inaccurate, apart from the practical difficulties attaching to it; but the other methods above indicated remain in use to this day. With some few additions and modifications, they still constitute the best methods of arriving at the value of a gas-producing material.

A very popular method of testing coal is by means of a model gas-works, constructed on a small scale. It may be capable of dealing with the 10,000th part of a ton, 1568 grains, or something less than ½ lb. of coal, or with the 1000th, 100th, or 10th part. For practical purposes, the largest set of apparatus is to be recommended, because it enables the conditions of working to be brought very close to those which actually obtain in practice. A fire-clay retort can be employed, and may even form one of

an actual setting. Or better even than this, where the circumstances will admit, a small complete gas-works may be used as a testing station. This is the practice of the Paris Gas Company, who have a testing gas-works comprising four beds of seven ordinary retorts, with condensing, purifying, and measuring apparatus in proportion; and the gas made is sent out as a part of the ordinary supply. Any large gas undertaking would find it well worth while to adopt a similar plan. In attempting to deal with small quantities of coal, as with the 1oooth part of a ton apparatus (which is perhaps the most generally used, being the largest that can be conveniently set up in an ordinary apartment), several conditions come in that are distinct from those obtaining in practice. The charge is carbonized in a layer about 1½ inches thick, and only occupies one-third, or less, of the entire space in the retort. Consequently, the bulk of the gas comes off in about half an hour. It is scarcely necessary to point out that these circumstances are much more favourable to the production of gas than those prevailing in the retort-house, where the thickness of the charges is about 6 inches, and the period required for its exhaustion from eight to twelve times as long as with the experimental retort. The former receives a more liberal supply of heat, according to the work it has to do, than the latter.

The smallest size of apparatus mentioned—that for dealing with 1568 grains of coal—is very suitable for illustrating the production of gas as a laboratory or lecture-room experiment; and, in the hands of a careful operator, it is capable of yielding useful information. An apparatus of this kind, devised by the late Dr. T. Richardson, is described in Crookes's "Select Methods of Chemical Analysis," p. 607. An ordinary combustion-tube, heated in the usual manner, is used as the retort. The eduction-tube passes first into an ordinary Woulfe's bottle, which corresponds to the hydraulic main, and serves to collect the tar and liquor. From this it goes on to a chloride of calcium tube; next through a set of Liebig's bulbs, charged with lead oxide dissolved in a solution of caustic potash; then through a second drying-tube partly filled with dry stick potash, and partly with calcium chloride; and lastly into a gasholder. The weight of the coke is arrived at by weighing the tube after the charge is worked off, and deducting from the result the weight of the empty tube, which should have been previously ascertained. The other vessels are weighed before being connected up, and again at the close. The increase of weight in the Woulfe's bottle, together with that of the first drying-tube, gives the weight of the tar and ammoniacal liquor contained in the coal. The gain shown by the Liebig's bulbs (to which must be added the weight of any moisture found to be absorbed in the second drying-tube), gives the carbonic acid and sulphuretted hydrogen. The latter can be separated by filtering off the insoluble lead sulphide from the solution, carefully washing, drying at not more than 212°, and weighing. The yield of gas can be measured in the usual way; and the quantity obtained (about a cubic foot) is sufficient for analysis, for testing in the jet photometer, &c.

The apparatus for testing the 1oooth of a ton has been so frequently described that a passing reference to various authorities will be sufficient now. At the 1869 meeting of the North British Association of Gas Managers,* Mr. G. R. Hislop described a form of retort and setting heated by means of an atmospheric gas-burner. A complete 1oooth of a ton apparatus, as devised by Mr. W. Sugg, is described and illustrated in "King's Treatise on Coal Gas," Vol. I., p. 97. At the 1885 meeting of The Gas Institute, Mr. T. Newbigging gave an illustrated description of a testing apparatus, with several practical hints as to the working, which should be consulted by any who contemplate the erection of appliances of the kind. He recommends an experimental retort heated by gas, as supplied by Mr. T. Fletcher. Several modifications in the apparatus as generally used are suggested in a series of articles on "Coal Testing and Analysis," by Mr. John T. Sheard, which have lately appeared in the JOURNAL,† in which the facilities for obtaining reliable indications of what may reasonably be expected in practice, by means of the 1oooth of a ton test, are considered at some length. Passing on to larger forms of testing apparatus, attention may again be directed to the chapter in "King's Treatise on Coal Gas" above referred to; also to a description of a 10th of a ton apparatus, with details as to its use, by Mr. T. O'Connor Sloane, Chemist to the New York Gaslight Company,‡ and to an article by Mr. H. Leicester Greville, Chemist to the Commercial Gas Company, describing the system of testing gas coals as practised by himself. This gentleman uses small clay retorts, capable of dealing with 7 lbs. of coal as a charge.

A perusal of the various papers above referred to is extremely suggestive, in more than one direction. The results obtained by skilful operators, with the experimental apparatus, are in all cases higher than those realized in practice. But it is remarkable that the deficit is being reduced to a considerable extent by recent improvements in the way of generator furnaces and mechanical charging, which seem to show decidedly that a part of the difference is due to the fact that the charge is not laid in so evenly in practice, and also that the effect of introducing the cold charge is to reduce the temperature of the retort to a degree considerably below that at which distillation is commonly supposed to take place. So that, in practice, the gas is given off at a lower temperature than that at which it is evolved in the experimental retort. In this connection it will be interesting to refer to a paper read by Mr. A. Scott at the 1879 meeting of the West of Scotland Association of Gas Managers,* in which the difference between the published analyses and the actual working results obtained from several different kinds of coal are recorded and commented upon.

* See JOURNAL, Vol. XVIII., p. 697. † See Vol. LI., pp. 233, 324, 369. ‡ See JOURNAL, Vol. XXIX., p. 828.

WATER GAS: ITS MANUFACTURE AND UTILIZATION.

By JOSEPH VON LANGER.

Since Felice Fontana, in the last century, first decomposed steam by the action of incandescent fuel, thereby producing a mixture of hydrogen, carbonic oxide, and carbonic acid, various methods have been adopted for utilizing his discovery; and all gases so made have gone by the name of "water gas." These gases vary greatly in composition, owing to the difference in the quality of the fuel and other material used in their production. This will be seen from the analyses (all of which, with the exception of the first, are taken from the *Glaser Annalen*, 1889, p. 282) contained in the following table:—

Fuel used.	CO_2	CO	H	CH_4	N	Other Marsh Gases.	Olefiant Gas.
Coke . . .	4·00	40·00	50·00	—	5·30	0·70	—
Anthracite . .	2·05	35·38	52·76	4·11	4·43	—	—
Do. and naphtha	3·80	25·70	31·80	20·80	4·20	—	13·10
Do. do.	3·10	25·20	28·30	26·60	1·20	—	15·60
Do. do.	0·14	28·26	37·20	18·88	2·64	0·06	12·82
Coke, oil, and tar	—	14·85	47·39	—	—	27·20	10·55
Coal and tar .	0·307	6·303	25·25	—	—	58·41	9·023
Coke and coal .	0·50	3·54	94·08	—	0·12	—	—

Note.—The above are analyses of (1) water gas made at Baron Rothschild's ironworks, Witkowitz, Austria; (2) water gas made in America; (3) Lowe gas; (4) Tessié du Motay gas; (5) Granger gas; (6) White gas; (7) Leprince gas; (8) Gillard gas.

These gases may be divided into two main classes—viz., those which do, and those which do not, give a luminous flame. In both cases either coal, coke, anthracite, or charcoal is used; the first result being pure water gas, which, if required for lighting purposes, is carburetted with the product from the distillation of fluid carburetted hydrogen. As already stated, water gas is the result of the decomposition of steam by passing through incandescent fuel. With the fuel at 900°, a mixture of hydrogen and carbonic acid is produced; and if the temperature be increased to 2200°, the resulting gas is hydrogen and carbonic oxide—*i.e.*, the lower temperature produces in the gas a greater quantity of carbonic acid, and the higher temperature a greater quantity of carbonic oxide. The gas required for practical purposes is one rich in carbonic oxide, and therefore the term water gas may generally be taken to represent a mixture of equal volumes of hydrogen and carbonic oxide, or, in weight, 6 parts of hydrogen to 94 parts of carbonic oxide. The mixture usually contains a small proportion of carbonic acid, nitrogen, and often marsh gas; but this does not prevent its being commonly described as pure water gas. In some cases it is advisable to make a gas poor in carbonic oxide and rich in hydrogen. For this purpose a special apparatus is necessary; and the process is similar to that for making hydrogen.

The apparatus for making water gas varies according to the quality required. For heating the fuel, two different kinds of appliances are available: (1) old type, with retorts; (2) new type, with generators. In 1854, Kirkham took out a patent in England for blowing the fuel hot in generators; the steam being driven through the fuel from the top. Tessié du Motay, the founder of the whole American water-gas industry, conducted experiments with generators in 1872. He was the first to use pure water gas for metallurgical purposes, and carburetted water gas, made in generators, for lighting. There have been three distinct stages of improvement in the production of water gas: (1) The manufacture of carburetted water gas in retorts, carried on in England and on the Continent from the beginning of this century until 1870. (2) The manufacture of carburetted water gas in generators, conducted in North America from 1870 until now. (3) The manufacture of pure water gas in England and on the Continent from 1880 up to the present time.

Appliances for making water gas poor in carbonic oxide have been built in the first and second periods. One apparatus of the third period, which has been very generally adopted, and been recently brought prominently before the public in this country, is known as the German type. This is practically the same process as that patented by Kirkham in 1854; the novelty consisting only in some improvements in details of the construction of the apparatus. In working this apparatus, two kinds of gas are produced—first, producer gas, during the heating of the fuel; afterwards, water gas, in the cooling of the fuel by the passage of steam. In 1886, when Engineer at the extensive iron and steel works of Baron Rothschild, at

* See JOURNAL, Vol. XXXIII., p. 765.

Witkowitz, I erected plant of this type for making 50,000 cubic feet of water gas and 200,000 cubic feet of producer gas per hour; and having had the superintendence of the manufacture of 175 million cubic feet of pure water gas at those works, I am able to speak with authority as to the results of the work of the German type of apparatus. In considering the efficiency of this plant in action, it is necessary to ascertain the total amount of heat introduced, and the ultimate disposition of that heat. Heat is introduced by means of fuel and air, and a certain amount is produced by burning the carbon. Heat is expended in the decomposition of the steam, and a further amount is carried away with the highly superheated gases leaving the apparatus, and in the slag and coke removed in cleaning; the difference not so accounted for being the amount of loss through the cooling water and radiation. There is no doubt that the German type of apparatus has produced pure and rich water gas; but it has certain very serious defects in comparison with other producers in use in metallurgical processes, inasmuch as something like 50 per cent. of the heat-units in the elements used are absolutely lost. One of its principal weaknesses, however, is the highly abnormal loss of heat by radiation, and especially by the use of the water-cooled ring, which reaches the high proportion of 10 per cent. In an apparatus of better construction, however, one-half the heat now lost by undecomposed steam, by radiation, and by the cooling water-ring, can be saved.

Although it cannot be reasonably anticipated that gas will entirely supersede solid fuel for all classes of work, and allowing for the fact that direct firing does not involve the necessity for large capital expenditure or specially skilled workmen, it is beyond doubt that, where very high temperature is required, solid fuel cannot be maintained in use with success. It need scarcely be said that where gas has already come into use, solid fuel will never regain its former position. It may be useful here to compare the three systems of firing—by solid fuel, by producer gas, and by water gas—in the first place from a theoretical, and secondly from a practical standpoint. For the production of 10,000 units of heat we require: Coal, 0·739 lb.; producer gas, 9·6 lbs.; water gas, 1·524 lbs. Now, 1 lb. of coal requires for complete conversion 10·4 lbs. of air; the same weight of producer gas requires 0·6 lb.; and of water gas, 3·7 lbs. In the burning of 0·739 lbs. of coal with 7·685 lbs. of air, 8·344 lbs. of the products of combustion result; 9·6 lbs. of producer gas burning with 5·76 lbs. of air gives 15·36 lbs. of combustion product; and 1·524 lbs. of water gas, with 5·638 lbs. of air, 7·162 lbs. of product. Taking into consideration that the temperature of the product of combustion on entering the chimney is in the case of the direct fire 800°, and in that of the gas fire 700°, the amount of heat lost is as follows: Direct fire, 1600 units; producer gas, 2580 units; water gas, 1203 units. The theoretical loss in the products of combustion is therefore: By direct firing, 16 per cent. of the total amount of heat; when producer gas is used, 25·8 per cent.; and in the case of water gas, 12 per cent. In practical work, however, these figures are completely altered. The solid fuel requires for total conversion a much greater volume of air than gas, especially rich and light-burning gases with a low amount of carbonic acid and nitrogen. The following are the practical results obtained in heating 4-inch billets, 150 lbs. each, for rolling, with twelve-hour shifts: With coal: production of steel, 7 tons; consumption of coal per ton, 10·32 cwt.; cost, 5s. 1½d.; heat-units per ton, 14,284,800; four workmen employed. Producer gas: production of steel, 10 tons; consumption of gas per ton, 63,000 cubic feet; cost, 4s. 6d.; heat-units per ton, 7,642,368; three workmen employed. Water gas: production of steel, 16 tons; consumption of gas per ton, 9450 cubic feet; cost, 3s. 4½d.; heat-units per ton, 2,664,900; three workmen employed. These figures show that, for the same amount of work, the water-gas furnace requires 1000 heat-units; the producer-gas furnace, 2878 heat-units; and the direct fire, 5735 units. It will also be seen therefrom that 1 cubic foot of water gas does the same work as 6·6 cubic feet of producer gas. The producer gas in this case was not of the same quality as the producer gas made in the water-gas generators, as it contained 119 heat-units per cubic foot, while producer gas from water-gas generators contains 83 units per cubic foot. A cubic foot of producer gas with 119 heat-units has the same value as 1·43 cubic feet of that with 83 units; and 1 cubic foot of water gas has the same value as 9·44 cubic feet of producer gas generated in water-gas apparatus of the German type. The explanation of this discrepancy between theory and practice is that, in actual work the quantity of air required for the total conversion of producer gas is much more than that theoretically necessary; while with water gas this difference is very greatly reduced, and for one volume of nitrogen in the water-gas furnace, there are two volumes in the producer-gas furnace.

Readers of the JOURNAL will have seen by the "Register of Patents" that, in conjunction with Mr. Leonard Cooper, I have designed and patented a new system with the object of making water gas only; recuperative furnaces being employed, and the producer gas made in blowing hot being utilized for heating the blast. The generator is so constructed that a large quantity of air enters at various points, and is distributed throughout the entire area. The heat drawn away from the generator with the product of combustion is used in the recuperator for heating the blast, and the waste heat leaving the generator with the water gas is utilized for decomposing the steam not already decomposed in the generator. A much larger proportion of the fuel is burnt to carbonic acid than is the case with the German type of apparatus, and greater heat is obtained at less cost. The importance of such an improvement will be at once apparent, and it can be adopted with much advantage for the production of either pure or carburetted water gas.

Carbon burns to carbonic oxide if the temperature is sufficiently high, and the air enters into intimate connection with the fuel—in this case one volume of oxygen burning two volumes of carbon; but if the temperature is lower, and the air travels more quickly through the fuel, carbon burns to carbonic acid, one volume of oxygen burning one volume of carbon. It is clear from these data that fuel can be completely converted to carbonic acid with a large quantity of air and at a temperature not too high, especially if the products of combustion are drawn quickly away; but with a higher temperature the fuel is converted partially to carbonic acid, and to a greater extent to carbonic oxide. A pound of carbon burnt to carbonic oxide produces 4450 units of heat; the same quantity of carbon burnt to carbonic acid produces 14,550 units of heat. The process for making water gas being intermittent, the fuel is first highly heated and afterwards cooled down. It is by no means difficult to burn the fuel, when cooled down, to carbonic acid. The fuel is quickly heated, and would burn to carbonic oxide if the blast were continued; but before this can take place the valves are reversed, and steam is blown in—the result being to produce water gas. Of the 54 lbs. of carbon used in making 1000 cubic feet of water gas by the German type of apparatus, 32·7 lbs. are burnt to carbonic oxide, and 4·8 lbs. to carbonic acid in blowing hot—the heat so produced being 215,799 units. If the combustion is so effected that 20·15 lbs. of carbon are burnt to carbonic acid, and 16·7 lbs. to carbonic oxide, the production of heat will be increased to 379,655 units, or 163,856 units more than in the German type of apparatus. The quantity of heat so saved is sufficient to decompose 25·14 lbs. of steam, and so make 1000 cubic feet of water gas.

By the new system, the heat left in the generator, per pound of carbon, is 4426 units more than by any former process. If the air is heated to 1000° Fahr., it carries into the generator 2080 units of heat. While, therefore, in previous systems, for every pound of carbon burnt in blowing hot, the heat left in the producer is 2936 units, by the new system there are left altogether 9442 units; showing a clear gain of 6506 units. Even supposing that the practical results are not exactly the same as this theoretical calculation, there can be no doubt that this new system places the manufacture of water gas on an entirely new footing, and that the production of water gas from a given quantity of fuel is much greater than by any former system. By the utilization, as far as practicable, of the waste heat of the producer gas and water gas, and by working with a less quantity of cooling water, the greater portion of the heat now absolutely lost is saved.

The cost of water gas is made up of fuel, labour, interest on capital, depreciation and general charges, steam, and water for cooling; the cost under each heading being to a very large extent dependent upon the construction of the apparatus. In that now under consideration any kind of fuel may be used, and the quantity consumed is greatly reduced. The cost in wages, interest on capital, depreciation, and general charges is, of course, reduced in inverse ratio to the extent of production, which, by this system, is fully 50 per cent. more than by any other type of apparatus. The saving of steam is about 20 per cent., by reason of the fact that the loss of undecomposed steam is avoided; and, in comparison with the German type of apparatus, the consumption of water for cooling is practically *nil*. The cost of producing water gas by this system is therefore enormously less than by any hitherto introduced.

I will now consider briefly the uses of water gas. This gas can be advantageously employed in all cases where a hot and clean flame is required. Amongst the operations in which it will be found more especially useful may be mentioned welding, puddling, re-heating, and all other processes in iron, steel, brass, nickel, zinc, copper, and lead. In chemical-works, glass-works, and potteries, also, great benefit can be derived from its use; and for engines up to a certain capacity, water gas is the cheapest motive power of the present time. It is employed for driving electric engines, and for illuminating workshops; and in countries where naphtha is sufficiently cheap, water gas has almost entirely superseded coal gas as an illuminant. Even where coal gas continues in use for lighting purposes, a proportion of water gas mixed with it is a valuable factor in reducing the cost and increasing the power of illumination. It is well known that in America carburetted water gas is in extensive use; and when a sufficiently cheap supply of mineral oil is obtainable in England, it will be produced here at a low cost. For illuminating workshops, where a clean and bright light is indispensable, the gas is carburetted in the lamp itself by naphthalene, and in this way lights of 30 to 900 candle power are obtained at a very low cost. With regard to the use of water gas for motive power, at the Witkowitz works it is employed in driving a number of gas-engines of from 6 to 50 horse power. They work with the greatest efficiency; and the consumption of gas is only 35 cubic feet per horse power per hour, compared with a consumption, when using steam power, of at least 2·2 lbs. of coal per horse power per hour, and much more in the case of small engines. In the passage of steam through long pipes,

a large amount of condensation, and consequent loss, always takes place, and these pipes necessitate a continual expenditure in repairs. By the use of water gas this loss is avoided, and the pipes are much cheaper than those needed for steam, besides requiring less repair. The introduction of this gas is therefore a source of economy, more especially for driving small engines in exposed and isolated situations. Its success in this direction is a fact of the utmost importance, and ensures for the gas a prominent position as a fuel in the future. Water gas is used in many works on the Continent and in this country for welding. The installation is so arranged that the gas is mixed with a given quantity of air in a blower, and is then burnt at a certain pressure through a specially constructed tuyere for welding together the edges of two plates, the edges of a tube, &c. The thickness of the articles welded varies from $\frac{1}{8}$ to $\frac{5}{8}$ inch; and the time occupied in the operation is usually from one to five minutes. The welds are superior to those made in the open coal fire; being in most instances equal to 90 per cent. of the strength of the original plate. All work done by the use of water gas is much cheaper and of better quality than by the old methods.

It is urged as an argument against the use of water gas that it is poisonous; but at the works at Witkowitz, already referred to, during the production of 175 million cubic feet of this gas, under my direction, not a single accident occurred. There is no doubt that if it is used with proper precautions, and the pipes are properly fitted, the risk of accident is very slight.

TECHNICAL RECORD.

SOCIETE TECHNIQUE DU GAZ EN FRANCE.

Annual Congress at Lyons.

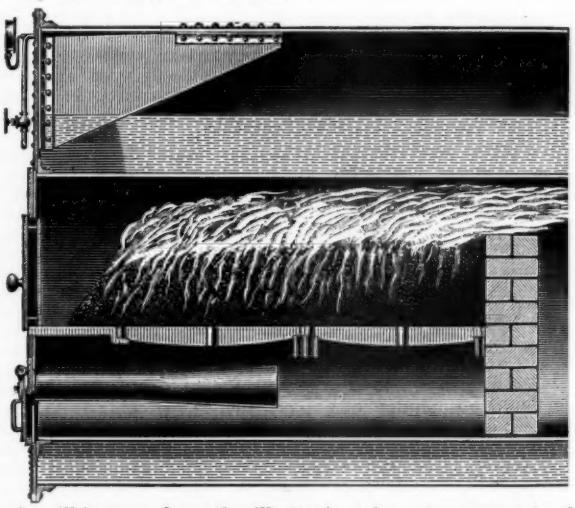
The Annual Congress of the Société Technique du Gaz en France opens to-day in the Philharmonic Hall, Lyons, under the presidency of M. Le Treust. The proceedings will extend over four days; the last being spent at Geneva, whither the members and friends will proceed on the previous afternoon. The business to-day will consist, as usual, of the admission of new members, the presentation of the reports of the Committee and the Treasurer, and the nomination of office-bearers for the current year. These matters having been disposed of, the President will deliver his Inaugural Address. This will be followed by reports on the prizes awarded for memoirs sent in in the competition of 1889-90, and for the best papers presented at the last congress. The remainder of the morning will be spent in the reading and discussion of papers. After luncheon, other technical questions, raised in communications presented, will be considered till the hour for adjournment arrives. In the evening, the members will be entertained at a banquet by the Lyons Gas Company; and after this they will visit the Company's electric light station. Unfortunately the Company are in the midst of a strike of their gas stokers; but, of course, this will not interfere with the cordiality of the reception they will meet with at the hands of the Directors. The whole of to-morrow will be given up to papers and discussions; the evening being set apart for the usual subscription dinner of the Society. Thursday morning will be devoted to a visit to the works of the Lyons Gas Company; and in the afternoon a start will be made for Geneva. On Friday morning the members will muster by nine o'clock, and proceed at once to inspect the water-power works installed on the Rhône, and afterwards the electric lighting station. This will dispose of the time till the luncheon. In the afternoon the members will be invited by one of the Genevese Gas Companies to take a trip on the beautiful lake for which their city is famous; and in the evening they will be entertained at dinner by the two Companies supplying the city.

The programme of business for the congress, as given in the *Journal des Usines à Gaz*, to which we are indebted for the foregoing particulars, contains a good list of papers and communications. The memoirs sent in to compete for the Society's prizes are three in member. One is on the ventilation of buildings lighted by gas; another, on gas as a motive power; and the third, on a subject which has rarely, if ever, been dealt with before—viz., the extent to which underground waters are affected by gas-works. In the ordinary papers which will come before the meeting, M. Eichelbremmer will describe a system of recuperation for retort-furnaces in small gas-works; and M. Moirand will offer a few observations on the Lachomette gas generator furnaces and recuperators. M. Bergeon will introduce to the notice of the members an appliance for regulating the flow of tar employed in heating retorts; and a modified form of the Pélouze and Audouin condenser will be described by M. Rouget, who will also show a prepayment and a constant measure gas-meter. Other papers will deal with the indication and regulation of pressure; Herr Lux will describe some new gas-balances; M. de Lachomette with have something to say on the manufacture of sulphate of ammonia; and coke-breaking and the utilization of breeze will have attention by other gentlemen. The lighting by electricity of high-power gas-lamps will be brought forward by M. Delafollie; and M. Guéguen will describe a method of ensuing protection, by means of athermanous screens, against the heat usually radiated from gas-burners. M. Delahaye is identified with the subject of electric lighting; and this year he will deal with it in combination with the supply of gas—the particulars for his paper being drawn from the last report of the Board of Gas and Electric Light Commissioners of Massachusetts, to which several references have been made in our columns. He will likewise make some remarks on the use of gas-engines in the production of the electric light. Another name well known in connection with the new system of illumination—that of M. Monnier—also appears in the list of contributors of papers; his subject being Mr. Crompton's system of canalization for electric lighting.

It will be seen from the foregoing that the subjects to be brought before the members are varied and useful in character; and although the discussions at the meetings of the French Society do not usually extend to the length of those which take place at gatherings of English gas engineers, there is no doubt the topics introduced will elicit remarks which will come as useful addenda to the communications when they appear in their collected form in the Society's Transactions.

THE UTILIZATION OF GAS-WORKS REFUSE FOR FUEL.

Messrs. Meldrum Bros., of Cathedral Yard, Manchester, have introduced an arrangement of forced draught, specially designed for utilizing what has hitherto been the almost worthless refuse which accumulates at gas-works. By the very simple arrangement shown in the accompanying illustration, this forced draught enables coke dust, pan breeze, coal dust, ash-pit refuse, and cannel coke to be employed as fuel in the boiler furnace; and a Cornish boiler which Messrs. Meldrum have fitted up at their own works with this forced draught, is fed simply with the commonest breeze from gas-works, and supplies steam for driving the whole of the machinery and plant. A representative of the JOURNAL recently had an opportunity of inspecting this boiler, so fitted up; and the steam pressure was being readily maintained at from 60 to 65 lbs., while in the furnaces a thoroughly bright fire was kept up, which it seemed almost incredible to believe was produced by such poor and otherwise comparatively worthless fuel as that used.



As will be seen from the illustration, the arrangement is of the simplest character possible, and is intended to secure either a minimum cost of fuel or a maximum efficiency of boiler power, irrespective of the cost of the fuel. The forced draught is obtained by introducing, underneath the furnace-bars, a steam-jet or blower, of very simple design, but at the same time most efficient in securing the object aimed at. In addition to the blowers, there is also a special arrangement of the furnace for using such small fuel as coal or coke dust or breeze. It is, of course, necessary that the fire-bars should be placed close together, so that nothing of value falls through; and in furnaces which are intended to burn the above-mentioned description of fuel, specially-designed bars are supplied, which only allow of the finest ash passing between them. The ash-pits are also closed by means of a well-fitted loose cast-iron plate, which carries the blowers, and is provided with a door for removing the ashes; but with the special form of bars, this does not require attention oftener than once daily. The fires can be forced or slackened by merely opening or closing a steam-valve; the whole arrangement being within the capacity of any ordinary fireman, as there are no quick-running shafts or other mechanism to get out of order. The steam for operating the jet is taken direct from the boiler; but the quantity required is so small as not to at all affect its efficiency. Only 4 per cent. of the evaporation is used in creating the forced draught; and this small weight of steam is no more than is necessary to preserve the bars. The use of steam for the blower has the further advantage of preventing the clinkers from adhering to the bars, and keeps the latter so

cool that they last a much longer period than with the ordinary forced draught from a pan.

Messrs. Meldrum's arrangement of forced draught is not only applicable where it is desired to utilize what would otherwise be almost worthless fuel, but can be applied where increased boiler efficiency is needed. By the assistance of this arrangement, boilers may be worked to their full power even where the natural draught is very deficient; as with a forced draught the chimney has no other function than to remove the fire gases after combustion is completed. Messrs. Meldrum claim that, with their arrangement, the efficiency of a boiler in which ordinary fuel is employed can be increased fully 25 per cent.

A number of the appliances above described have already been supplied to gas-works; and they are also being fitted to ordinary boilers for securing increased efficiency.

GAS IN THE LAUNDRY.

While the application of gas for cooking, heating, motive power, and other purposes has made rapid progress, it has not made greater headway in these departments of industry than in laundry engineering. There are at the present time numerous firms who rely upon gas for the boiling, drying, washing, ironing, and calendering of linen; and improvements in machinery are being constantly made to accomplish these objects. The gas-iron is not by any means a new invention; but it is singular that this valuable appliance is not so popular as it might and certainly ought to be. The reason is that laundrymaids are not "educated up" to it. Girls are taught to manipulate the old-fashioned flat iron; and they have no opportunity for improvement. A laundry proprietor's employees are somewhat of a roving community; and therefore, instead of wasting time in teaching his workers how to use new tools, he lets them have their own way, with the result that gas-irons are eventually discarded.

This being the case, we are glad to notice that certain American laundrymen are just now coming forward to teach the English how to do washing. Recently a new manageress was appointed to the Southsea steam laundry; and the Directors have wisely allowed her to start instruction classes for laundry work, including the use of gas-irons. At this particular place we know these gas-irons have for years been laid aside; and yet at the American laundry—the Brunswick—at Portsmouth, nothing but these appliances are used, the polish of the linen being simply superb. We have also to a great extent to thank the Americans for designing so many machines to utilize atmospheric gas. Messrs. Armstrong, of 13, Fore Street, E.C., the agents for the Troy Machinery Company, have introduced an excellent machine, called the "Combined Shirt and Collar Ironer," consisting of a polished steel cylinder heated internally with gas. The advantage is that, like a gas-engine, the machine can be used at any minute. English laundry engineers have made progress in utilizing gas for Découdum machines, which heat large cylinders that will iron table-cloths, counterpanes, &c., up to 5 feet in length. Among these may be named Messrs. T. Bradford and Co., of High Holborn; Messrs. Manlove and Co., of Nottingham; and Mr. Cudlipp, of Church Street, Edgware Road. The last named of these firms is also an inventor of the "Rotary" collar-polishing machine, which, heated by gas, will work by hand and polish 50 collars or cuffs in five minutes.

Very few of the laundry engineers have as yet adopted gas for washing-machines. The fact is that direct steam-pipes from boilers have been carried to the washers. It is therefore to the credit of Mr. J. Greenall, of Portland Street, Manchester, that he has contrived a steam-washer, which he now shows to perfection at the Military Exhibition at Chelsea. The machine is practically a perforated cylindrical box, into which the dirty linen is placed. It is revolved, either by hand or power, in a tank containing 3 inches of water. This is heated by gas; and when boiling, the steam generates through the cylinder, and the expansion carries off the dirt, besides bleaching the clothes at the same time. By a machine of this kind, no housewife need light her copper-fire, and washing becomes extremely easy. In drying-rooms in steam laundries, gas has been utilized for heating purposes; but there is a demand for an invention to prevent the danger of fire. If such firms as Messrs. Manlove and Co. can invent gas drying-rooms, they will find plenty of work.

It is to be hoped that the new laundry instructors who are to be appointed by the School Board for London, will not omit from their course the many methods of laundering by gas, especially as there are world-wide openings for those who know how to use the gas-washer and the gas-iron. In the interests of gas companies, it would not at all be out of place if public lectures, similar to the cookery lectures now so common, were given to ladies who are interested in this matter, and who are now above doing their washing in the old-fashioned way. In fact, we are prepared to say that if a competition were started among laundry engineers to produce the best combined washer and ironer suitable for domestic purposes, a machine could be placed on the market at a price not far exceeding cooking-stoves. Gas companies, we are sure, would gladly welcome such an invention; and "gas-launderers" could be rented to gas consumers in the ordinary way. A large consumption of gas might be expected all the year round, especially in hotels, colleges, hospitals, and similar establishments.

REGISTER OF PATENTS.

Gas-Meters.—Thorp, T., of Whitefield, and Marsh, T. G., of Lytham. No. 7233; May 1, 1889. [8d.]

This improvement in gas-meters has for its object to enable the maker to sell, and the consumer to obtain, an equivalent in gas to the value of coins placed in a receptacle in the meter.

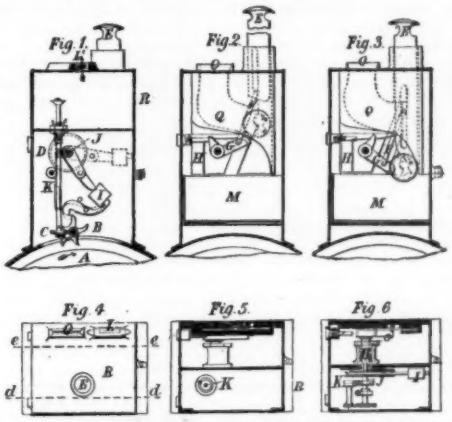


Fig. 1 is a sectional elevation through the line *d d* of fig. 4, showing the improvement applied to wet meters when it is desired to adjust the distance which the valve K is lifted for each coin used. Fig. 2 is a sectional elevation through the line *e e* showing the relative positions of the coin, with the actuating parts of the apparatus at the time the coin is inserted. Fig. 3 shows the positions of the coin with the actuating parts when the coin is falling into the receptacle. Fig. 4 is a plan of the top of the apparatus. Figs. 5 and 6 are sectional plans.

A is the drum of a wet meter, having one or more cogs actuating the star-wheel B, which is mounted on a shaft having a worm gearing into a wheel with a worm D, near its upper end, gearing into a friction-wheel. E is the handle or push, having a slot into which a pin on the rod F enters; a pin on the top end of the rod entering a hole in the arm G. H is the shaft on which the arm G is secured. I is a weighted lever which engages into a V-grooved wheel, and rests at its lower end on a gravity catch. The grooved wheel is secured to a shaft J, carrying a wheel into which the rack K (having at its upper end a valve) gears. L is a sliding bearing actuated by the screw shown, when it is desired to put the worm-wheel into or out of gear. There is a receptacle provided (preferably secured by means of a soft metal rivet), which is punched every time the receptacle is cleared and renewed—being impressed at each end with the collector's number or other suitable device. Q is an aperture for the insertion of coins, and L^1 the gas outlet. R is the casing or chamber above the meter into which the apparatus is placed.

In carrying out the invention, one or more cogs or their equivalents are caused to project from the periphery of the drum A, so that as it rotates the star-wheel B, placed immediately above the drum A, becomes rotated also, to the extent of one tooth for each tooth on the drum. This star-wheel communicates its motion through other gearing to the rack K, preferably placed in a vertical position, having at its upper end a conical or other valve of suitable shape, so that as the drum rotates the valve lowers, and by entering its seating eventually stops the supply of gas. When the handle E is pulled up, the arm in connection with it through the shaft H, the arm G, and the rod F rise and allow the gravity catch to engage into the star-wheel B, and thus prevent its rotation until a coin is put into the aperture Q, when it falls into the position shown in fig. 2. The handle E, now being pushed down, forces the coin edgeways between the casing R and the end of the arm G. In doing this the arm becomes depressed, as also the weighted lever I, and so causes the grooved wheel (shown in figs. 1 and 6) to partly rotate. Now as the rack K with its valve is geared into a wheel secured to the shaft J, the valve is lifted out of its seating, and allows gas to pass to the outlet L^1. The rack K being also in connection with the star-wheel B through the before-mentioned gearing, this star-wheel is caused to rotate as the gas escapes, and the valve gradually lowers. By these means the gas is eventually shut off, unless in the meantime another coin has been inserted and forced into the receptacle M. By preference the weighted lever I is formed with very fine teeth, so as to engage in the grooved wheel in the manner of a ratchet. In the form of apparatus shown, the rack K is not in positive communication with the star-wheel; one of the wheels of the train being fitted on to an arbor or shaft J, and held in position preferably by a spring pressing against its periphery. In order to adjust the distance which the valve is required to move for each coin used, and thus determine the quantity of gas equivalent to it, which this apparatus admits of, a screw (actuated from the outside) to form a stop, against which the arm, between which and the side of the chamber the coin passes, abuts when the handle is lifted.

Gas-Engines.—Clerk, D., of Sutton Coldfield. No. 8805; May 28, 1889. [11d.]

In most gas or vapour engines as at present constructed, to use compression, says the patentee in his specification, one impulse is given for every four movements of the piston, or one impulse for every two revolutions of the crank-shaft. In some gas-engines an impulse is given for every revolution; but the fresh charge is generally utilized to eject the burnt gases resulting from the previous explosion. Though the cylinder may be thus charged, and an explosion obtained for every revolution of the engine, yet there is a difficulty in completely expelling the exhaust gases without at the same time losing some of the fresh

charge at the exhaust ports. The main objects of this invention are' therefore, (1) to arrange a gas-engine in such a manner that an impulse can be obtained at every revolution, while the charge is admitted, and the exhaust expelled, by the positive action of a secondary or displacer piston working in the same cylinder as the power or main piston ; (2) to dispense with an explosion altogether in some circumstances, and so burn the gas or vapour that any desired power of impulse may be obtained capable of increase or diminution at will, as with the power in steam-engines ; and (3) to so arrange the linkage by which the secondary piston is driven from a crank-pin that the proper motion is given to that piston, and it is caused to pause at the required time. The patentee is well aware that attempts have been made to construct engines to work with two pistons in one cylinder ; but such attempts have hitherto, he says, been unsuccessful, mainly because of improper modes of actuating the secondary piston, and failure to give it the peculiar motion necessary.

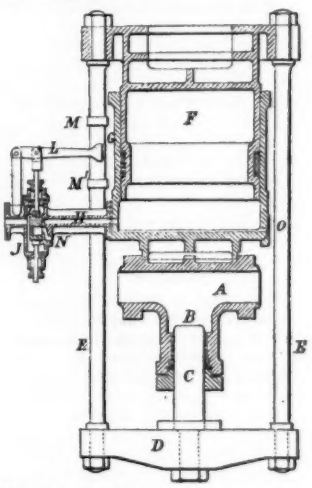
In applying the invention to an explosion gas-engine having two pistons, the patentee adopts the following arrangement :—The engine contains one cylinder in which two pistons work ; and the motor piston is of the common trunk kind working in an open-ended cylinder, and running over the exhaust port towards the extremity of its working stroke, as in an engine described in patent No. 1809 of 1881. The other end of the cylinder is closed by a cover, through which a suitably packed and guided piston-rod passes, and actuates the secondary piston within the cylinder. A rocking-shaft passes under the cylinder, and connects by a lever to a crank-pin on the crank-shaft by a connecting-rod. The lever is thus moved to-and-fro by the movement of the engine ; and a link or rod from that or another pin in the lever connects to the secondary piston-rod, guide, or crosshead, so that the secondary piston is driven from the crank-shaft. The centre of this pin is so arranged with reference to the guide or crosshead that, when near one extremity of its stroke, the crosshead-pin, lever-pin, and rocking-shaft are in the same line, so that considerable movement of the shaft may occur about the "dead centre" position, while the crosshead or guide, and therefore the secondary piston, remains nearly stationary. By allowing a suitable lead or advance position in the direction of revolution to the motor piston crank-pin, this piston (after receiving an impulse) moves forward until it uncovers the exhaust port. Meanwhile the secondary or displacer piston remains almost stationary, as its lever and rod move about the "dead centre." But when the exhaust ports are uncovered, the further movement causes the displacer piston to shift rapidly forward and discharge the exhaust gases ; while it takes in behind it a fresh charge through suitable valves. It moves out till it approaches near the edge of the exhaust port, by which time the motor piston has moved back to cover these ports. The two pistons then return at nearly the same rate until the compression end of the motor piston stroke is nearly reached, when this piston begins to slow down. But the displacer piston still moves back ; and the charge behind it is transferred, by suitable valves, to the space formed between the pistons. The displacer piston arrives at the end of its stroke almost at the same time as the moter piston ; and the interval between the two forms the explosion space. The mixture therein may be ignited by any suitable means ; but preferably by an incandescent tube, which opens to the mixture by uncovering a port due to the movement of the displacer piston. The motor piston then moves forward under the pressure of the explosion ; and the displacer piston remains nearly without movement until the exhaust position is attained. When the displacer piston begins to move away from the motor piston, the valves are so arranged that gas flows from the gas-pump into the air which is being transferred to the explosion space. An explosive mixture is thus formed between the pistons, and only there ; so that at no time is there any explosive mixture except in the explosion space. By this method there is no possibility of back ignition behind the displacer piston, as only air is there admitted, and the explosive charge is not formed until the moment arrives at which it is required. When the explosive mixture is formed in this way, the engine is governed by lifting, or opening, or holding open, the inlet gas-pump valve ; and then the gas passes to-and-fro to the gas-bag and back again without discharge. An ignition is thus missed, because the explosion space contains air alone.

When the invention is applied to the production of motive power rom gas without explosion, the method of forming the mixture and igniting it is modified in the following manner : The valves are so arranged that some air is first permitted to pass from behind the displacer piston to the space between the two pistons—that is, the two pistons are first allowed to move slightly apart on the compression stroke, and then the gas under compression is allowed to stream into the passage through which the compressed air is passing. It there mixes with it, and is passed by a grating or plate (perforated with holes and protected with wire gauze) to the igniting arrangement, which may consist of a flame inside the cylinder in the path of the stream from the grating, or any other well-known method. The mixture is caused to ignite whenever it begins to flow. There is thus no accumulation of mixture in the combustion space, and then an ignition or explosion ; but immediately imflammable mixture passes the grating, it ignites and burns as a flame within the cylinder, and heats up the air or other gases within it. The pressure rises at the end of the stroke by the movement of the displacer and gas-pump pistons ; but the pressure of combustion never exceeds that of the air behind the displacer or the gas in the pump. The pressures of the combustion on one side of the displacer and the air on the other being equal, however, no work is expended by the engine in raising the pressure ; and the motor piston moves forward under the impulse just as in the case of an explosion. In this method of applying the invention, it is possible to reduce the power of each impulse by injecting less flame, and so getting a lower pressure of combustion. This may be done by throttling the gas supply to the gas-pump, and so causing the pressure in it to reach that in the motor cylinder at a later period than with full gas ; the amount of flame injected being thereby reduced. Or air may be admitted to the gas-pump, and so a more dilute mixture formed and a feebler flame. By either of these means the impulse may be given to the motor piston with light or heavy loads.

Such engines, when made with a suitable number of cylinders, may be arranged to reverse, by slightly modifying the linkage of the displacer pistons so as to render it adjustable for revolution in either direction.

Regulating the Flow of Water and other Liquids in Mains.—Schönheyder, W. A. G., of Clapham Park, Surrey. No. 10,402 ; June 26, 1889.—[8d.]

This invention refers to apparatus for regulating the flow of water, oil, or other liquids in mains, by forming a chamber on or in communication with the main, the contents of which chamber are subject to the pressure of a piston, plunger, or diaphragm connected to a second piston, plunger, or diaphragm in a cylinder to which elastic fluid pressure is admitted by a slide or other valve device, in such a manner that when, owing to an increase or decrease of flow in the main, the pistons or plungers are caused to move beyond certain limits, the slide or other valve is automatically actuated so as to admit fluid pressure to or exhaust fluid pressure from the cylinder. The accompanying illustration shows a vertical section of one arrangement of apparatus for carrying out the invention.



A is the main through which the water is being forced by a pump Through the stuffing-box of a chamber B formed on the side of the main projects a plunger C, the outer end of which is connected by a crosshead D and rods E to the piston or plunger F of a cylinder G supplied with steam or other fluid pressure through a passage H ; the supply being governed by a slide-valve I in a chest J, into which the fluid enters. The slide-valve rod is connected to a tappet-lever L, situated between stops M M¹ on the rod E ; so that, when the piston F moves inwards to a certain extent, the stop M, in bearing against the lever L, causes the slide-valve to be moved so as to admit fluid pressure to the cylinder, while when the piston moves outwards, to a certain extent, the stop M¹ acts on the lever L in the contrary direction. This moves the slide-valve so as either to cut off the supply of fluid pressure, or put the interior of the cylinder in communication with a discharge port N. O is a small opening for draining off water of condensation from the cylinder.

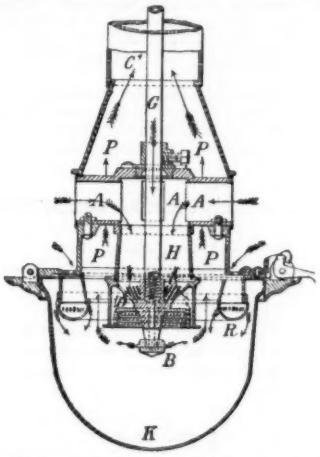
The action of the apparatus is as follows : Assuming the liquid in the main to be passing at the normal rate of flow, the elastic pressure in the cylinder G is so adjusted as to keep the piston F, and consequently also the plunger C, in about the positions indicated, in which the plunger protrudes slightly into the chamber. On an increase of flow taking place in the main, the plunger will be forced outward to a certain extent, thereby increasing to a corresponding extent the capacity of the chamber B, and at the same time moving the piston F inward in its cylinder. This will compress to a corresponding degree the elastic fluid, until, by the additional pressure thus obtained, the resulting increased inward pressure exercised by the plunger C will be *in equilibrio* with the outward pressure exerted upon it by the liquid in the main. Should this state of equilibrium not be established before the stop M has been brought in contact with the lever L by the inward motion of the piston F, then by the further motion the slide-valve I will be moved so as to open the passage for the fluid pressure supply ; and a fresh charge of such fluid being thus admitted to the cylinder, the state of equilibrium will be established. On the rate of flow in the main decreasing, the pressure in the cylinder, being in excess, will force the piston F outward and the plunger inward—thus forcing liquid out of the chamber B into the main, and equalizing the rate of flow. This inward motion of the plunger will continue either until the stop M¹ has moved the lever and slide-valve back into the position in which the supply of fluid pressure to the cylinder G is cut off again, or until the stop has moved the slide-valve still farther, so as to put the interior of the cylinder G in connection with the discharge N. This reduces the pressure until the equilibrium has been restored again ; the inward motion of the piston F causing the stop M¹ to move the slide-valve back into the position in which it closes both the supply and exhaust. By duly proportioning the size and stroke of the plunger C, to the variation of flow to which the liquid in the main is subject, such variation can be more or less perfectly compensated for, so as to render the rate of flow practically uniform.

Regenerative Gas-Lamps.—Fullford, E., of Clapton, and Van Laun, H. T., of Blenheim Crescent. No. 10,447 ; June 27, 1889. [8d.]

This invention relates to gas-lamps with inverted burners, in which the gas supply passes down a central passage to the burner, while the air supply is led into contact with surfaces that are heated by the flame and the hot products of combustion proceeding therefrom ; a portion of the air being made in some cases to pass down centrally

through the burner, so as to issue through orifices situated below the flame. Lamps of the kind to which the improvements relate are described in patents Nos. 2853 and 7335 of 1888. One of the modifications which form the subject of the present invention is represented in the accompanying engraving, a vertical section of a lamp.

G is the gas-supply pipe, terminating in a circular burner B, from which flames issue horizontally outwards, bending upwards within a hollow reflector ring R to the passages P, by which the hot products of combustion pass up to the chimney C1. Air entering by passages A,



which cross the other passages P, flows down the central channel H through the perforations of a screen C, and then through a number of perforations in the turned-down lips of rings D to the flame. These rings, instead of being made in one piece as shown, may, however, be separate, and placed one above another. The air thus supplied to the upper side of the flame is heated by its contact with the walls of the channels conducting away the products of combustion, and also by its passage through the heated screen C and heated rings D. Besides the air thus supplied to the flame, additional air enters the hollow reflector R, and issues through perforations in the reflector to supply the lower and outer side of the flame—this air being also heated by its passage through the reflector. The burner, reflector, and passages are enclosed, as usual, within a glass globe K.

Incandescent Firing-Tubes for Gas-Engines.—Williams, H., of Stockport. No. 11,162; July 11, 1889. [4d.]

This invention relates to the highly-heated incandescent tubes employed for firing explosive charges in gas and similar motor engines. Such tubes have hitherto been usually made of iron; and as they are exposed to the action of a very hot flame, they soon oxidize. In this state they are practically worthless, as the effect of the oxidation of the iron is to prevent the passage of a large portion of the heat into the interior of the tube. In fact, says the patentee, after about 30 hours of constant use, unless the tube be replaced by a new one, there is great probability that it will cease to ignite the charge. Experiments made with a great variety of metals and materials have demonstrated that a tube composed of pure nickel gives wonderfully good results; and the inventor proposes to take a solid block or bar of nickel and bore it out so as to form a tube closed at one end, and having the required internal diameter and thickness of shell. These nickel tubes, it is claimed, are very durable, and far more certain in igniting the charges than ordinary iron tubes.

APPLICATIONS FOR LETTERS PATENT.

8259.—Vosper, C. W., "Improvements in burners for mineral oil or other lamps." May 27.

8345.—Ross, J. H., and Atkins, E. E., "Improvements in downwardly burning oil-lamps." May 29.

8350.—Oechelhaeuser, W. von, "Improvements in gas-stoves." May 29.

8373.—Walker, E. W., "Improvements in and apparatus for the manufacture of gas for lighting and other purposes." May 30.

8377.—Fletcher, W. F., "Improvements in instruments for ascertaining the hourly consumption of gas by gas-burners." May 30.

8382.—Morrison, D. G., and Harper, W. F., "Improvements in steam, gas, and other motive power engines." May 30.

8397.—Gillson, S., "Improvements in liquid meters." May 30.

8431.—Seage, F. J., "Improvements in gas motor engines." May 30.

8535.—Pitt, S., "A process and apparatus for the manufacture of illuminating gas." A communication from *E. J. Jerzmanowski*. June 2.

8554.—Eitle, C., "Apparatus for charging retorts." June 3.

8565.—Boult, A. J., "Improvements in or relating to incandescent gas-burners." A communication from *J. C. O. Chemin*. June 3.

8603.—Clark, A. M., "Improvements in gas-burners." A communication from *A. P. Frechette* and *D. Circe*. June 3.

8618.—Johnston, J., "Improvements in self-generating gas or vapour burners, applicable for lighting or heating purposes." June 4.

8645.—Lea, R. H., and Brett, W. J., "Improvements in gas and vapour engines." June 4.

Strike of Gas Stokers at Lyons.—On Monday last week the gas stokers of Lyons came out on strike, and arrangements had necessarily to be promptly made to supply their places with others. According to a telegram in a London paper, policemen and soldiers have been taken on to do the retort-house work.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Gadd and Pease Systems of Gasholder Guiding.

Sir,—In reference to my letter addressed to you last week, you now very properly state that "neither the Journal nor the meeting of The Gas Institute offers a fitting field for the settlement of patentees' differences;" and it is precisely because I agree with this dictum, that I object to you constituting yourself a judge, by assuming judgment, apparently *ex parte*, on the matter in question, especially as the same is at present *sub judice*, and well known by you to be so.

Longsight, Manchester, June 11, 1890. W. F. Mason.

[We suppose that Mr. Mason thinks his letters calculated to serve some useful end, or he would not have written them; but what this end is, we cannot divine. If we had attempted to do any such dreadful thing as constituting ourselves a judge respecting a matter that is *sub judice*, we should doubtless quail under his reproof; but how this interpretation can be attached to a remark that two men will exhibit "rival methods" of doing a certain thing, is more than we can grasp. It seems to us that if anybody has been guilty of "assuming judgment" in this matter, it is Mr. Mason himself, since his statement that "Mr. Pease has nothing in principle but what is contained in Mr. Gadd's specification," is a far more partial, and therefore objectionable, expression of interested opinion on a point specially reserved for the decision of a Court of Law, than anything implied in calling two patentees "rivals."—Ed. J. G. L.]

Mr. West and the Assistant-Secretary of the Stokers' Union.

Sir,—I was desirous of not troubling you again; but Mr. Ward will persist in making misleading and erroneous statements. He says: "I wonder whether he [meaning me] has forgotten Christmas Eve of 1883, when the men would make no gas at the Rochdale Road works, Manchester, owing to the high-handed proceedings of Mr. West in docking the men one day's pay without a moment's warning. Two telegrams were sent to him to his residence at Heaton Norris, Stockport; but in vain," &c.

To begin with, Mr. Ward is three years out in his date; and no telegrams were sent to me. The circumstance to which he refers occurred on Christmas Eve, 1880. The simple facts of the case are as follows:—It had previously been the custom to make the men's time up to Friday night; an official coming from the Town Hall to pay them on that day as they left work. Endless mistakes arose, because there was insufficient time to properly check the books. It was therefore decided that the books (as is almost the universal custom in other gas-works) should be made up to Thursday night and Friday morning, so as to allow proper time for making up the books and preparing the wages. Notice was given of this alteration; and I did not hear of any objection to it until the Deputy-Manager called me up at about one o'clock in the morning, stating that the men had struck work in two out of four retort-houses, and that they wanted to see me upon some matters which they had not fully explained to him. At this time I was suffering from bronchitis, and it would have been dangerous for me to have gone out on that frosty morning; so I sent an instruction that they were to go to work at once, and see me at ten o'clock in the morning, or leave the works immediately. But before the Deputy-Manager had returned, Mr. Chester, the then recently-appointed Manager, had shown them the folly of the action they had taken, and they immediately went to work. The following morning I expected to meet the deputation at ten o'clock to hear the nature of their grievance; but they did not appear. I, however, insisted on knowing the cause of the men leaving off work; and at last the spokesman said that they were very sorry that they had caused any trouble, but on the Christmas Eve some of them had imbibed a little too much and got excited, and were advised to leave off work. I pointed out the serious mistake they had made, when the men realized their position, apologized, and promised that it should not occur again; and I am glad to say that they kept their promise. No doubt Mr. Ward was one of the leading spirits who caused the men to act so foolishly. Their action was certainly a glaring breach of the Conspiracy Act.

Knowing Mr. Ward's propensity for stirring up strife, I think I was justified in warning Mr. Beale, the Resident Engineer at Beckton, against engaging such a man on his works.

I was not aware that I engaged Mr. Ward. I suppose he dressed up for the occasion. At any rate, his deception enabled him to get a cup of tea; and at the same time to single out two men from South London, who, he says, will ere long repent the action they have taken. I shall be glad if he will give me the names of the men to whom he refers, so that I can legally protect them against his intimidation.

Manchester, June 14, 1890. John West.

Coal-Owners and the Price of Coal.

Sir,—In your observations upon the present high, and the future price of coal, and the rapacity of coal-owners, I think you lose sight of some important considerations.

According to the free-trade doctrines now prevalent, the coal-owner has the same right to sell his coals, as the labourer his labour, for the highest price he can obtain; and he has the same right as the labourer to combine with others to obtain that price, without being deemed rapacious. It appears to me that the enhanced cost of labour can have contributed little to the enhanced price of coal; but the diminution of the hours of labour, and consequent restriction of output, is having a most important effect in raising the price. Is it not an axiom that, when the supply is in excess of the demand, the seller is compelled to submit to low prices; whereas when the supply is short of the demand, it is the buyer who must submit. As a large proprietor of gas stock, I hope the increase in price of coal will subside to a moderate figure, if it continues; but I think that all depends upon the relation of the supply to the demand.

June 12, 1890. A Gas Director.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Friday, June 13.

THE WATER SUPPLY OF EAST HADDON.

Earl SPENCER rose to call attention to the delay in the action of the Local Government Board, after an inquiry made by one of their Inspectors on Sept. 21, 1889, at East Haddon, Northamptonshire; and to ask when replies would be given (1) to an application made on Jan. 20, 1890, from the Brixworth Sanitary Authority for sanction to a loan for water supply in East Haddon; and (2) to a complaint made on March 4, 1890, by Mr. Albert Pell, as to alleged default of the Sanitary Authority. He explained that last autumn there was a violent outbreak of diphtheria in a village close to where he lived; and out of a population of about 500 persons, there were from 26 to 30 deaths within three months. The Local Government Board heard of this; and on Sept. 21 an inquiry was held by an Inspector, who remained in the district a fortnight, and made most minute inquiries. The Sanitary Authority were somewhat divided as to how to meet the outbreak, and there was a considerable minority opposed to the plan of the majority; the result being a delay of action. He could not blame the minority for that. But the report was not received until the 7th of December. He thought this was a grave delay in view of the desperate state of things in the village. No interim report had been made; and he maintained that there ought to have been something upon which the Local Authority might have acted. The report being expected, however, a paralysis of the action of the Local Authority ensued. They decided to give a new water supply to the village; and on the 20th of January an application was made, but no answer had as yet been received. No steps could therefore be taken to supply the water. This was a serious matter, because the lives of the inhabitants were in danger; and the only means of providing a remedy was to carry out some sanitary works, such as drainage or water supply. Within the last few weeks a fresh outbreak had occurred; and he had received a telegram from the Vicar stating that three lives had recently been lost. While entertaining a great respect for the officials of the Local Government Board, he believed they were so overwhelmed with business that it was impossible for them to answer all inquiries with the promptitude demanded.

Lord STANLEY OF ALDERLEY objected that the default on the part of the Sanitary Authority had long existed, and was owing to the Chairman of the Board of Guardians and of the Sanitary Authority, who, instead of putting the law and the nuisance inspector in motion, wrote a complaint in the *Fortnightly Review* in 1885, putting the blame of several insanitary cottages in East Haddon on the neighbouring county gentlemen. Since the report of a Sub-Committee of the Brixworth Sanitary Authority, about three years before 1885, on an outbreak of fever in East Haddon, nothing had been done to improve or suppress the bad cottages; and it appeared, from the report of the Local Government Inspector of November last, that these overcrowded insanitary cottages were still in existence. He thought the noble Earl should, as neighbour and patron of the Vicar of Harlestone, have seen that he did his work better.

The EARL of JERSEY explained the circumstances which retarded the action of the Local Government Board, and accounted for the delay.

The EARL of KIMBERLEY criticized the action of the Local Government Board in matters such as this.

The subject then dropped.

During the past week the following progress was made:—

Bill read the first time: Glasgow Corporation Bill.

Bill read a second time and committed: Whitehaven Gas Bill.

Bill read the third time and passed: Newcastle and Gateshead Water Bill.

The Gas and Water Orders Confirmation Bill [Aldershot Gas and Water Order], the Wallasey Local Board Bill, and the Whitehaven Gas Bill were referred to a Select Committee, consisting of Lord Belper (Chairman), Earl Rosse, Lord North, Lord Houghton, and Lord Addington; to meet on Tuesday, June 17.

HOUSE OF COMMONS.

Monday, June 9.

WATER COMPANIES' CHARGES.

A Bill to regulate and limit the powers of water companies in respect of their charges for the supply of water was brought in by Mr. Causton and the other Metropolitan members, read the first time, and ordered for second reading on the 19th inst.

OVERHEAD WIRES.

Mr. DIXON-HARTLAND asked the Attorney-General whether the new electric light companies in London were legally empowered to disfigure the streets, and greatly increase the risks of fires, by putting their wires overhead instead of underground.

The ATTORNEY-GENERAL: Under the Electric Lighting Acts of 1882 and 1888, powers are reserved to the County Council and to the Board of Trade for regulating and controlling the cases in which overhead wires may be used; and, in my opinion, these powers are sufficient. The information before me does not tend to show that overhead wires increase the risk of fires.

ELECTRIC LIGHTING PROVISIONAL ORDERS.

Sir M. HICKS-BEACH presented three additional Bills (Nos. 10, 11, and 12) to confirm Electric Lighting Provisional Orders relating to the following places:—

No. 10.—Ashton-under-Lyne, Bournemouth, Coatbridge, Hastings, Northampton, and Windsor.

No. 11.—Chatham, Rochester, and District, Manchester, Plymouth, and Wrexham.

No. 12.—Crystal Palace and District and Paddington.

During the past week the following progress was made:—

Bills read the first time: Bradford Corporation Water Bill; Newcastle and Gateshead Water Bill; Plymouth Corporation Bill.

Bills read a second time and committed: Electric Lighting Provisional Orders Bills (Nos. 1 to 4)—[see *ante*, p. 983].

Bills reported: Local Government Provisional Order (Gas) Bill; Mid Sussex Water Bill.

Bill read the third time and passed: Dublin Corporation Bill.

The Airdrie and Coatbridge Water Bill, the Dewsbury and Heckmondwike Water Bill, the Morley Corporation Water Bill, and the Ystrad Gas and Water Bill were referred to a Select Committee, consisting of Mr. W. Davenport (Chairman), Mr. Picton, Mr. Yerburgh, Mr. Lloyd George, and Mr. Bonham-Carter (Referee); to meet on Wednesday, June 18.

Petitions were presented against the Bradford Corporation Water Bill, by the West Riding County Council and the York New Water-Works Company; and the petition of the Liverpool United Gas Company against the Liverpool Corporation Bill was withdrawn.

HOUSE OF COMMONS COMMITTEE.

Tuesday, March 25.

(*Before the Right Hon.* JAMES LOWTHER, *Chairman; and Messrs.* VERNON *and* LYALL.)

HUDDERSFIELD WATER BILL.

This Bill—the object of which was to authorize the acquisition of the Wessenden Reservoir and of additional land, to extend the district of supply, and to sanction the borrowing of £500,000—came before the above Committee to-day.

Mr. BIDDER, Q.C., Mr. BALFOUR BROWNE, Q.C., and Mr. CRIPPS, Q.C., appeared for the promoters; Mr. POPE, Q.C., Mr. LITTLER, Q.C., and Mr. FULTON for the London and North-Western Railway Company; and Mr. PEMBER, Q.C., Mr. LEDGARD, Q.C., and Mr. ERSKINE POLLOCK for the Wessenden Reservoir Company.

Mr. BIDDER, in explaining the objects of the Bill, said that in considering it, they would have to deal with two Bills, for they would have to treat the Wessenden Bill as to some extent a competing measure. One of the proposals of the Bill was to authorize the transfer of the powers of the Wessenden Commissioners, who under their own Bill asked further powers. In addition to this, his clients sought powers for an extension of their district, and for the acquisition of land. What the Corporation intended to do was to construct a reservoir, to be called the Butterley reservoir. The want of water was felt principally in the higher zones. This was in lieu of the Booth reservoir, than which it was much larger. Then there were tanks and other works; but they, of course, were subsidiary. By clause 7, the Bill provided that after a certain date the Wessenden reservoir would vest in the Corporation; and then, by clause 17, the Corporation were bound to give compensation water of 3033 gallons of water per minute. The reservoir at Wessenden would supply the higher portions of Huddersfield with pure water. Lower down, the new reservoir to be constructed would supply compensation water, which did not need to be quite so pure, to the mill-owners. That was the whole scope of the scheme. He was aware that some question as to the amount of the compensation water was to be raised; but that was a matter for the Committee after they had heard the evidence. There was no reason for the objections of the Wessenden Reservoir Commissioners; for the scheme would not either affect or injure them. The Commissioners of the Wessenden Reservoir in their petition said that they were not to get compensation under the Bill. But they were simply public trustees, and could not by any means divide any money among them. What did they ask compensation for? Compensation for being relieved from a public duty for which they received no remuneration! He looked upon it as a most audacious claim. They also said that the Corporation already had a supply of water more than sufficient for the domestic supply; and they supported this with figures which they thought proved it, but which did not, for the Corporation had various zones of supply, and they might have plenty of water in one zone and none in another. Upon principle, however, they were quite agreed that compensation water should be given to the mill-owners. He could not understand, however, their statement that the Corporation only offered 2 million gallons a day, while they obtained 3¼ million at present. As a matter of fact, the Corporation had as compensation constructed the Head Wessenden reservoir, and had paid off all the mortgages on the other reservoir. The Commissioners now asked to be allowed to use their works for the sale of water in competition with the Corporation. Were not the Corporation justified in saying that if compensation were needed, then they were bound to supply it; but if it were not to be so used, then the proper people to sell it were not the Commissioners, but the Corporation? The mere fact that the Commissioners proposed by their Bill to sell water for trade purposes, showed that the water was no longer needed for compensation water. The Corporation had had the whole cost of the reservoirs placed upon them, and were the proper persons now to take them over, and they were willing at the same time to be invested with the obligation to supply the compensation water. With respect to the petition of the London and North-Western Railway, who were the owners of the Huddersfield Canal, they claimed the right also to compete with the Corporation in the supply of water for trade purposes.

Wednesday, March 26.

Evidence was given this morning on behalf of the promoters.

Mr. *Godfrey Sykes*, the Mayor of Huddersfield, said he had had an intimate knowledge of the town and its requirements for the last 60 years. In his opinion a larger supply than at present existed was necessary, and that an additional supply could be most advantageously afforded by the scheme of the Corporation.

Cross-examined: Witness said he had been for six or seven years a member of the Corporation Water Committee; but he did not remember being present at the statutory ratepayers' meeting in 1888, at which it was decided to promote a Bill preserving the rights of the mill-

owners and the Wessenden Commissioners. He thought the present Bill did preserve those rights, by reason of the compensation water which was given. No other terms of compensation had been offered to the Commissioners. The Corporation were entitled to charge 25 per cent. more for water outside the borough than inside. Four or five years ago it was necessary to have a rate-in-aid, which did not apply to the outside districts at all.

Mr. Alderman *Crosland* deposed that he was a member of the Water Committee of the Corporation, and had always taken a great interest in the water supply of the town. In 1889 they obtained powers to construct the Deerhill and Blackmoor Foot reservoirs. The Corporation did not propose to interfere with the reservoirs of the London and North-Western Company; but they desired to construct the Butterley reservoir to meet the increasing wants of the district. He was impressed with the necessity of affording an additional supply, more particularly for the high-level districts, which were now dependent upon springs for their water.

Mr. *G. B. Nalder*, the Town Clerk of Huddersfield, was then examined at length as to the provisions of the Bill.

Thursday, March 27.

Further evidence was given to-day in favour of the Bill.

Mr. *J. B. Robinson*, a County Alderman and Chairman of the Local Board of the Colne Valley, said he considered the scheme as proposed by the Bill would be a great advantage to the inhabitants of the town. There would be ample security that compensation water would be sent down to the manufacturers. He thought it was well that the powers asked for should be vested in the Corporation. If anything happened to the Wessenden reservoirs, there was no security that the manufacturers would get a supply of water; but with the Huddersfield Corporation there was. If there was any deficit on the water accounts of the borough, it would be made good from the rates of the borough; but the Corporation had no power to levy a rate outside the borough. This justified there being a higher rate outside than inside the borough.

Cross-examined: Witness said he was under the impression that the Corporation were going to give a regular supply for trade purposes. He thought it would be regular for sixteen hours each day.

Mr. PEMBER pointed out that the supply of compensation water was only to be given during twelve hours on five days a week, and six hours on Saturdays.

Witness said the Corporation had privately agreed to send down 3127 gallons per minute, instead of 3033 gallons mentioned in the Bill.

Mr. *George J. Symons*, of the Royal Society, said that of the average rainfall in the district of water collection, 23·8 inches out of 46 inches would be available.

Dr. *C. Meymott Tidy* gave evidence to the effect that the water in the Corporation district was very soft. It was good for manufacturing purposes and for drinking. The canal water had been analyzed, and was found to be much inferior to the Corporation supply. It contained more organic matter.

Mr. *Thomas Hawksley*, C.E., deposed that he had been Engineer-in-Chief to the Corporation of Huddersfield for twenty years. The high-level zone of the town was more than 1000 feet above the level of the sea. It would be unsafe to continue without an additional source of supply. Since 1887 the supply had been drawn from the Wessenden Valley; and at present was about 23½ gallons per head per day—the domestic supply being 14 gallons per head per day. The mill-owners would get a generous amount of compensation water.

Cross-examined: The Butterley reservoir, when it was completed, would have a storeage capacity of 400 million gallons. There was no other district from which the water could be collected.

Mr. *E. M. Eaton*, the General Manager of the Sheffield Corporation Water Department, said he had carefully considered the scheme, and found the district over which authority was sought gave the only available supply. He did not think either the mill occupiers or the riparian owners would be injured. The compensation was being offered on a very fair basis to the mill occupiers supplied by the Wessenden Commissioners.

Cross-examined: Witness said he had no knowledge of any other watershed than that of Wessenden.

Mr. *G. Crowther* and Mr. *H. F. Beaumont*, M.P. for the Colne Valley Division, also gave evidence in support of the Bill.

Friday, March 28.

Mr. *Hawksley* was this morning re-called. In answer to Mr. PEMBER and the CHAIRMAN, he said that the additional quantity of water available below the Lower Wessenden reservoir, if utilized entirely for Huddersfield, was 1,751,000 gallons per day. If the Booth and Blakeley reservoirs were utilized exclusively for Huddersfield, the quantity of water available would be 1,074,000 gallons per day, *plus* a small quantity owing to the difference in size of the reservoirs—say, in all 1,250,000 gallons a day.

Mr. *J. Stanway*, Manager of the Huddersfield Corporation Water-Works, said he had occupied that position for twenty years. For trade and domestic use, the Corporation supplied 3,225,000 gallons a day. The increase had been principally within the last ten years. The domestic supply was 2,000,000 gallons per day. The additional supply was necessary for the high-level district.

Cross-examined: The scarcity of water arose from the additional powers which had been obtained by the Corporation.

By the CHAIRMAN: There was a population of 27,000 persons exclusive of Lindley, who could not be supplied under existing powers, and the higher levels could not be furnished with water from Deer Hill, which, moreover, was a compensation reservoir, not available, and giving a poorer quality of water than that proposed to be taken under the Bill.

Mr. *James Mansergh*, C.E., deposed that the scheme embraced in the Bill was an adequate one for Huddersfield, and gave proper compensation to the Wessenden Commissioners.

Mr. *S. C. Potts*, Borough Accountant, and Mr. *Jarmain*, the Borough Analyst, also gave evidence.

This closed the case for the promoters.

The Committee then decided to sit the next day to hear the opening of the case for the Bill promoted by the Wessenden Commissioners, and to take evidence of the petitioners against both Bills afterwards.

Saturday, March 29.

Mr. PEMBER, this morning, addressing the Committee on behalf of the Wessenden Commissioners as promoters, said he had previously told them that there would be no opposition, which indeed was his instruction.

Counsel here conferred; and at the close of the consultation,

Mr. PEMBER said he was happy to state that they had arrived at an arrangement, which he hoped would be satisfactory to the Committee. This, so far as the Wessenden Commissioners were concerned, was as follows:—Firstly, the Huddersfield Bill might proceed. Secondly, the Corporation should buy the Wessenden reservoirs of the Wessenden Commissioners at a fixed price of £50,000; and the Corporation should be bound to supply water to the persons along the line of the Colne—the riparian owners, mill-owners, and occupiers—for trade purposes at the same rate as the Corporation supplied water for trade purposes to persons within their own borough. Thirdly, the Corporation should pay the parliamentary costs of the Wessenden Commissioners. Fourthly, the Corporation should engage to do their best to pass a Bill through Parliament during this session embodying this agreement. Fifthly, if they failed to do so, they would proceed next session with a Bill for the same purpose. Lastly, if they failed to prosecute such a Bill next session, or if, having prosecuted it, they failed to pass it, then the Wessenden Commissioners should be at liberty to promote a Bill for the same purpose without opposition from the Huddersfield Corporation. The £50,000, added the learned Counsel, would be divided between the owners and occupiers of the falls.

Mr. BALFOUR BROWNE said the Corporation, under this arrangement, would take a certain quantity of water; and these owners and occupiers would be paid according to the proportion of their value.

Mr. PEMBER observed that, of course, if the Committee saw any reason against the proposed arrangement, it was obvious that he would have to go on with the Wessenden Commissioners' Bill. Under the proposed arrangement, the persons interested in the waters would get the money value of their property divided amongst them regularly according to their real interest; and they would obtain the water at the same price as their competitors in trade inside the borough. The Huddersfield Bill would then be a Bill which would have the effect of giving to the high-level districts the benefit of the water from the Wessenden reservoirs.

The CHAIRMAN: The Wessenden Commissioners would cease to exist?

Mr. PEMBER said he did not think they would cease to exist until all the money had gone. The right view would be to dissolve the Commissioners—not at any fixed date, but in the ordinary way, as soon as the money was distributed. The last clauses of the agreement that he wished to refer to were that the Huddersfield Corporation were binding themselves to proceed with a Bill to the best of their endeavours this year, and that if they failed to bring in a Bill, or bringing it in failed to pass it, then the Wessenden Commissioners should be authorized to do the same.

Mr. BALFOUR BROWNE said that the Corporation had for some time been seriously impressed with the necessity of obtaining more water for the high levels, and a better supply for the low levels. They had surveyed the district carefully, and had come to the conclusion, on the advice of the most competent engineers, that Wessenden was the only district from which they could procure the needed supply. Under the Bill, the Corporation thought they were giving sufficient compensation water. It was water the Corporation wanted; and in order to obtain it, they were quite prepared to buy off existing rights at a cost of £50,000. This money would be distributed among the people who had rights under the Act of 1836. If the Corporation failed to obtain a Bill, the Wessenden Commissioners would, as his learned friend had pointed out, be at liberty to proceed.

Monday, March 31.

The opposition of the London and North-Western Railway Company was taken this morning. At the commencement of the proceedings, an argument arose between Mr. Bidder and Mr. Pope on clause 10, as to taking water from the London and North-Western Canal; and the Chairman ordered the room to be cleared. After a consultation of the Committee, Counsel and parties were called in.

The CHAIRMAN said the Committee had decided to strike out clause 10, and to effect the consequential amendments in the preamble which were necessitated thereby.

Mr. BIDDER: That decision so entirely goes to the root of the Bill, Sir, that I must ask you to allow me a short time to decide what course we shall take.

The promoters retired for consultation. On their return,

Mr. BIDDER said: My clients have very carefully considered the question as to the effect of the decision by the Committee upon the Bill; and though, of course, it is a Bill very urgently required for Huddersfield, they feel that this decision is so entirely unprecedented in parliamentary practice, and so entirely goes to the root of the Bill, that they have no alternative but to withdraw it.

The CHAIRMAN: I cannot admit the remark as to the unprecedented nature of our decision.

Mr. BIDDER: I ought to have said that we were not aware of any precedent.

The CHAIRMAN: What becomes of the other Bill?

Mr. BIDDER: Oh, that is withdrawn by arrangement, Sir.

Monday, May 19.

As recorded in our "Parliamentary Intelligence" on the 20th ult., the Bill was re-committed during the preceding week; and it again came before the Committee to-day.

Mr. BIDDER stated that when the Bill was under the consideration of the Committee in March, the promoters felt that the effect of the decision then given would be practically to turn the London and North-

Western Railway Company into a rival water company, and the Bill was withdrawn. Since then, however, the parties had had an opportunity of conferring; and he submitted the following clause, which it was hoped, would meet the approval of the Committee:—"The London and North-Western Company shall not supply water for manufacturing purposes from their Huddersfield Canal within the limits of the Corporation for the supply of water, except to such an extent as they can supply water therefrom by means of their existing reservoirs and works without any alteration thereof, and without preventing or impeding the navigation of the said canal, or the conduct of the traffic thereon."

The CHAIRMAN: If parties choose to throw their Bills up without adequate consideration, they may find that other Committees will not deal with them as this Committee has done. It is really playing fast and loose with the forms of Parliament for promoters to throw their Bills up and then ask for them to be re-committed. We do not take the present action at all with the idea of holding out an inducement to people to do the same thing again.

Mr. BIDDER said he quite saw the force of the Chairman's observations; and added that things were often done on the spur of the moment for which, on mature consideration, people were sorry.

The CHAIRMAN then inquired what was meant to be covered by the words "any alteration thereof, or addition thereto."

Mr. BIDDER replied that the object of these words was to prevent the Company thereafter, by enlarging their reservoirs, from increasing their water supply, and that they were not intended to interfere with the maintenance of the works.

Mr. MASON (for the Company) said he would prefer to have the words changed to "enlargement or extension."

After some consultation,

Mr. BIDDER stated that the following words had been agreed to, which made it clear that maintenance and repairs were not affected by the clause:—"Without any enlargement or extension thereof, or addition thereto."

The Committee, having gone through the unopposed clauses, reported the Bill as amended to the House.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Friday, June 13.

(*Before the* LORD CHIEF JUSTICE *and Mr. Justice* WILLS.)

Gas Testing in the Metropolis—Appeals to the Chief Gas Examiner.

Mr. DANCKWERTS moved, on behalf of The Gaslight and Coke Company, for a rule calling upon Professor A. W. Williamson, the Chief Gas Examiner for the Metropolis, to show cause why a *mandamus* should not issue commanding him to hear Counsel on behalf of the Company upon two appeals. Under their Act of 1876, the Company are bound to supply gas of certain illuminating power and purity, and at a given pressure; testing-places and examiners being appointed. Under the provisions of the Act, the reports of the gas examiners are final and conclusive, unless appealed against; and penalties are imposed. The power of appeal is given by a subsequent Act. In December last two reports were made—one from the Hornsey Road testing-station and the other from the station at Camden Street. From these reports, the Company appealed; and a day was appointed for the hearing of the appeals. The Company appeared before the Chief Gas Examiner by Counsel, and desired to be heard. After argument, the matter was adjourned to a subsequent day, when Professor Williamson declined to hear Counsel except upon any point which it might occur to him should be argued. Thereupon the further hearing of the appeals was adjourned pending the present application. The question really turned upon the construction of section 12 of the Act of 1880, giving the power of appeal; the Company contending that, being a corporate body, they could only be heard by an individual attending on their behalf.

Their Lordships granted the rule.

Earls Barton Water Supply.—The Wellingborough Rural Sanitary Authority have instructed Mr. W. H. Radford, C.E., of Nottingham, to prepare a scheme of water supply for Earls Barton, as an alternative to one previously submitted by another engineer.

Electric Lighting Scheme for Wimbledon.—The Wimbledon Local Board have decided to light the town by means of electricity, in place of the present system of oil-lamps. The sum required for the installation, according to the estimate of Mr. W. H. Preece, will be £30,000; and the Board have applied to the Local Government Board for power to borrow this amount. The scheme has met with strong opposition from a section of the inhabitants of the district.

East Surrey Water Company.—The ordinary general meeting of this Company was held on the 7th inst., at the Company's offices at Redhill—Mr. E. Easton in the chair. In moving the adoption of the report, an abstract of which was given in the JOURNAL last week, the Chairman congratulated the shareholders upon the position of the Company, whose business, he said, had increased to such an extent, and the demand for the water was increasing so rapidly, that the Directors had found it necessary to make large additions to the works. He produced a table showing how the consumption had advanced from the establishment of the undertaking down to the present time. Sir F. Bramwell seconded the motion, and it was carried; and the dividends recommended were declared. The thanks of the shareholders were accorded to the Directors, and the sum of 100 guineas was voted to them for their services during the past year. The proceedings concluded with the usual compliment to the Chairman, and a special vote of thanks to the Manager and Secretary (Mr. J. R. Downes) whose services were highly eulogized.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY AND THEIR WORKMEN.

The Monthly Agreement—Important Concessions—The Stoking Machinery at Beckton.

As was surmised a fortnight ago, the form of contract between The Gaslight and Coke Company and their workmen, as originally framed by the legal advisers of the former, was not closed to modification; and during the past week, such concessions have been made on the part of the Company that there is now a fair prospect of a speedy settlement of the matter. The agreement in its new shape is spoken of very favourably by some of the workmen; and the objections of the Gas Workers' Union to the old one, so far as we understood them, have all been met. It is believed (but the information has not been communicated officially) that one or two of the leaders of the Union are contented with the alterations made; and if the Executive Committee are likewise satisfied, they will do well to forthwith withdraw their own proposed substitute, and counsel the men to accept the form as revised by the Company.

It will be remembered that what were regarded by the men as the objectionable features of the agreement were confined almost entirely to Clauses 1 and 2. The provisions of these, however, have been altered, and now read as follows:—

1. The workman shall continue in the service of the Company for 28 days, to be reckoned from the date hereof; and the workman shall continue in the said service until the said service shall be put an end to by a 28 days' notice in writing to be given at any time either by the workman to the Company or by the Company, through their agent, to the workman, of his or their intention to determine the said service at the end of 28 days from the date of the giving of the said notice.

2. If the workman absent himself from his work, or leave his employment without giving the aforesaid previous notice to the Company or their authorized agent, all pay which may then be due to him shall be absolutely forfeited to the Company; or if the workman shall neglect or fail to perform his work in any class or capacity in a proper manner by reason of drunkenness or otherwise, or shall refuse or neglect to obey or carry out the directions of the foreman under whom he shall for the time being be working, or the directions of any officer of the Company, or if he shall at any time while on the Company's works be guilty of any misconduct, then, and in any or either of the said cases, the Company or their authorized agent shall be at liberty to discharge the workman at any time without any notice, and the workman shall not be entitled to receive more than the proportion of wages which may be due to him up to the time of his dismissal in respect of the number of full and complete days during which he has actually worked: Provided always that nothing in this clause, or done in pursuance thereof, shall prejudice or affect any proceedings which the Company may be entitled by law to take against the workman.

The ground on which the men opposed Clause 1 was referred to last week; and as to Clause 2, a comparison of the amended clause with the original one (*ante*, p. 1033) will show that its provisions have been greatly relaxed. The men and their supporters, and many outsiders besides, regarded the terms as first proposed as far too severe. The summary dismissal of a man for insubordination or other misconduct, with the absolute forfeiture of all wages due at the time, was especially disagreeable to the men; but under the new clause, as will be seen, he will be entitled to receive the proportion of wages which may be due to him up to the time of his dismissal, in respect of the number of full days he has actually worked. The fact that a misdoer may be discharged without notice, and that the Company, if they think necessary, may take legal proceedings against him, is sufficient protection for them. Under the old clause, it would also appear that anyone filling an official capacity of whatever degree at a station, would possess authority to discharge a man; but according to the new clause in one person alone—"the authorized agent"—will that power now repose. The fears of the men that the old agreement would permit of their being transferred from one works to another were totally groundless, as each agreement is headed with the name of the station at which it is signed, and therefore it would have no application to any other station; but in order to satisfy them, it has been agreed to add to the words of Clause 4 those which are italicized—"The workman shall faithfully perform and serve the Company, *at the above station*," &c. On the whole, it would seem that the men will be in a better position under the agreement in its new garb than they would be if no agreement were in existence; while at the same time it gives to the Company the protection which primarily prompted them to introduce it. Mr. Trewby holds the opinion that the agreement will be accepted by the men, and come into force at an early date.

We have no information up to the time of going to press that the men have had an opportunity of considering with their leaders the modified agreement. It is stated, however, that they are still somewhat sore on not having been afforded an opportunity of discussing the terms of the agreement, through representatives appointed by themselves, with the Directors personally. Some of the men assert that the delegates who met Mr. Trewby were selected by the foremen, and that they did not fairly represent them; and they claim that they should have been allowed time in which to appoint men for the purpose properly acquainted with the views of the hands engaged in each section of labour. With regard to the desired interview with the Directors, the officials of the Union say they would like it to be understood that they had no wish to be present; and all they essayed to bring about was a meeting between the Directors and representatives of the men chosen by and from among themselves. It is rumoured that at one or two stations the men are adverse to a monthly agreement of any shape or form; but there can be no doubt that they will be well advised to accept the contract as it now stands.

Respecting the operation of Mr. West's stocking machinery in No. 12 retort-house at the Beckton station, everything is still proceeding satisfactorily. On Thursday, some of the Directors of the Company inspected the working of the machines, and were pleased at the successful way in which they were acting. The old Unionists at the station, of course, are anything but gratified to find that it has been so easy a

matter to man the house, and to get the work done in a regular and orderly way by new hands; and there is little doubt that if the trouble had not been firmly dealt with in its early stage, it would have developed into something far more serious.

THE BRITISH GASLIGHT COMPANY AND THEIR WORKMEN.

The Norwich Stokers Sign an Agreement.

In our editorial columns to-day reference is made to what has lately taken place at the Norwich works of the British Gaslight Company. It will be of interest to give here the terms of the agreement which has lately been signed by most of the Union men at that station:—

MEMORANDUM OF AN AGREEMENT made the day of 1890, between F. E. Linging, for and on behalf of the British Gaslight Company, Limited, in the county of the city of Norwich, of the one part, and of the other part. The said F. E. Linging, for the British Gaslight Company, Limited, agrees to employ the said if he shall remain sober, honest, industrious, and able to do the work allotted to him, for a period of months from the date hereof, at one or other stations of the said Company. The said agrees to serve the said Company for the said period of months in the carbonizing department, at the current rate of wages applying to such capacity. The said agrees to obey the orders of the foreman in charge.

As witness the hands of the parties.

F. E. LINGING.

Witness.

No obstacle will be thrown in the way of any man engaged under the above contract who may wish to leave the Company's employment before the expiration of the period of service therein agreed for, provided he shall notify such wish to the Engineer; and on receipt of such notice, if the service of such man can be dispensed with without detriment to the Company, permission will be given at the expiration of such notice as the Engineer may deem sufficient.

N.B.—The work in the carbonizing department to consist of two shifts per 24 hours.

LEEDS CORPORATION GAS SUPPLY.

Impending Trouble with the Stokers.

According to a notice given by the Leeds Corporation Gas Committee to the stokers and firemen in their service, a new code of rules will come into operation on the 1st of July; and the men were asked during the past week to intimate to the Managers of the different works before noon on Friday, whether or not they intended continuing in the employ of the Gas Committee under the new regulations. This intimation was not forthcoming; and it is stated by the representatives of the men that they intend to "stand firm" by an arrangement agreed upon in November last. Unless the Gas Committee withdraw the new code, or materially moderate it, a strike, it is said, is likely to occur. On behalf of the Committee, it is stated that the existing code was forced upon them last November, when they were practically powerless to resist it; and when there was every probability that, within the course of a few days, the town would have been in darkness during the greater part of each day. The Committee point out that one of the chief reasons alleged for the reduction of the working hours was that the men suffered from the hardship of having to leave their fires for the purpose of wheeling the coke and ashes out of the hot retort-house into the cold air. It is now proposed that they shall be relieved of this duty, and that labourers shall be employed, who will be restricted to this particular kind of work. The stokers and firemen are, under the proposed regulations, to be kept to their ordinary employment; being required to do 20 mouthpieces per man per day. The men object to the new code, inasmuch as it imposes upon them the duty of attending to three fires, instead of two as at present. Should the new regulations be enforced, the effect would be that the number of firemen, who receive 5s. per day, will be diminished, and labourers, at 3s. 8d. per day, will be taken on to wheel away the coke and ashes. The men work in three shifts—the first coming on at six o'clock in the morning, the second at two in the afternoon, and the third at ten at night; and their average working hours are 7½ per day. During that time they take eight draws, each of which occupies a little less than 20 minutes. There is a prospect that, when the 1st of July arrives, the men will not put in an appearance. In the meantime, in consequence of the intimation mentioned not having been given on Friday, the Gas Committee are said to be seeking stokers and firemen to fill the places of the strikers. The men have decided not to take any action at all in the matter, but at present to proceed with their work as usual. They have made known their strong objections to the new rules, and the grounds for them; and they await the further action of the Committee. On Sunday public meetings were held, to consider the attitude adopted by the Committee towards the men. The circular convening the meetings was addressed to "fellow-workmen," and was as follows:—"You will recollect all the changes which took place about six months ago in connection with the gas workers' conditions of labour—changes admitted on all hands to have been beneficial both to the workmen and to the township. The Leeds Town Council have determined to bring back, as far as possible, the old state of things, which was little less than slavery; and we are asking the public to attend these meetings, and show by their presence that they are not in favour of official coercion and tyranny. We have gained the eight-hour system; but we are practically being asked to do the work of twelve hours. If we allow this to come to pass, we shall be showing our sympathies, as a township, with what is unjust and retrograde in spirit. We appeal to the general public. They are our employers; and from them we expect justice to be shown."

The Stocksfield Water Company, Limited, is the title of an undertaking started with a capital of £2000, in £10 shares, to carry on the business of water supply at Stocksfield in Northumberland.

MALTA AND MEDITERRANEAN GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 60, Gracechurch Street, E.C.—Mr. J. BIRCH PADDON in the chair.

The SECRETARY (Mr. A. W. Cooper) having read the notice convening the meeting, it was agreed to take as read the Directors' report and the statement of accounts for the year ending March 31 last, the chief features of which were noticed in the JOURNAL for the 27th ult. (p. 983).

The CHAIRMAN moved—"That the report of the Directors, together with the balance-sheet and accounts annexed thereto, be approved and adopted." In doing so, he said that in the report the Directors formally announced the death of their colleague, Mr. Arthur Clarke who had had a long experience in all matters connected with gas companies, and who took an unfailing interest in the affairs of their own Company from the first to the last. In him the Directors lost an esteemed and amiable friend; and the Company an experienced Director. In the exercise of their powers, and in their desire to do the best they could for the concern, the Board offered the vacant seat to Mr. John Orwell Phillips, who accepted it; and the shareholders might well be congratulated on securing the services of a gentleman of such high distinction in the gas world. As to the working during the year, the Chairman proceeded to remark that, if the proprietors compared the present statement with that for the preceding year, they would miss the large increase of business which was then shown. He believed that during the year ending March, 1889, they had an addition to their business of nearly 10 per cent.; while in the past year, the increase was about 3·13 per cent. There were, however, counterbalancing circumstances. The expenditure had diminished; and there was a considerable advance in the value of residuals. The outcome of this was that they had a larger profit than in the previous year. During the twelve months they had had no disturbing incidents at all; and if they could but secure a continuation of these conditions, their prosperity would be assured. The state of affairs in Malta was pretty much the state of affairs of the Company. Things had gone on there very well during the year; and the Company's relations with the Government and the consumers generally were satisfactory. The Directors' expectations with regard to their new Manager (Mr. Starkey) had been more than realized; and it was not too much to say that, in consequence of his ability and devotion to the Company's interests, the Directors accorded to him their entire confidence. Occasionally the Directors heard of new schemes for electric lighting; but with gas at 4s. 6d. per 1000 cubic feet, they did not concern them very much. Petroleum, they found, was a vastly more important rival. With regard to the Malta station, he noticed that the increase in the consumption of gas was about 4¾ per cent.; and it nearly all came from private sources. This and a series of previous increases had made it necessary to provide additional storeage. The new gasholder which had been erected was an excellent piece of work; and the tank was very substantially built—the whole reflecting great credit on their Engineer (Mr. Soler), more especially as the holder was constructed under considerable difficulties. Mr. Soler was also engaged in building a new set of retort-benches, which would be completed by the winter; and then the works would be in a position to meet any probable demands for gas made upon them. At Corfu, the growth of consumption was something like 3¾ per cent.; and this was an increase upon increases. In the previous year it was 7 per cent.; and in the year before that 18 per cent. Corfu was, in fact, the most progressive of all the stations. Since 1880, the make of gas had doubled; the rental had doubled; and the profits more than doubled. At the present time they were engaged in providing additional retorts there; and these would be completed in readiness for next winter. The Sicilian stations still remained under the cloud which was caused by the interference with the commercial relations between France and Italy; but it was hoped that this cloud was only of a temporary character. The interests of the Company, he observed, were somewhat prejudiced by the disparity in the charges made for gas to the Municipality and local authorities and to the private consumers. The Directors had frequently essayed to alter this state of things; but with no good results. Recently they had made the attempt at Trapani, and now awaited the issue. It was almost a formality for him to say that the plant at the various stations was maintained in good order; if this were not so, they would not realize the returns from them which had been received. The stations were all either requiring additions, or were on the eve of doing so; and these would be made as soon as necessary. Regarding the balance-sheet, it would be seen that an amount of £1792 had been added to the capital; being the proceeds of the final call upon the second preference shares. On the other side, the capital expenditure was £2883, which was practically the cost of the new gasholder. The profit and loss debits were so nearly like those of the preceding two or three years, that it was unnecessary, the Chairman thought, to detain the shareholders in making any remarks upon them. He might, however, mention that if the £500 which was handed over to the executors of the Company's late Manager (Mr. E. Thorman) for the benefit of his wife and children was taken off these debits, it would be found that the working expenditure was about £178 less than it was in the previous year. With regard to the loss on exchange (£1181), this was higher, owing to the larger amount of money sent home from Corfu; but the actual rate of exchange was lower during the year. On the other side of the account, the gas rental amounted to £24,835; being an increase of £633. To obtain this £24,835, they carbonized 9318 tons of coal, which yielded 95,840,000 cubic feet of gas—being at the rate of 10,285 feet per ton. Of the total production of gas, 87,403,000 feet had been sold, which was at the rate of 9380 feet per ton of coal. In the case of the three London Gas Companies, the average sale of gas per ton amounted to 9532 feet; so that he thought the small variation between themselves and the London Companies might be taken as showing a very fair state of things at their works. The difference between the quantity sold and the quantity made was 8·80 per cent.; and considering that this applied to five distinct stations, and that they had a very large extent of small mains, this figure was satisfactory, and probably was as low as it would be likely to be. The quantity of gas made per ton, he might add, was rather higher than in the previous year, as was also

the quantity sold; the amount lost being a little lower. Respecting the residuals, coke, tar, and pitch, the receipts amounted to £4377; being an increase of £618. The item of fittings, meters, &c., stood at £1140, which was an advance of £177. The outcome of the working was a profit for the year of £11,435, being £1106 more than in 1888-9. After placing £1500 to the reserve account, and paying the dividends recommended on the various classes of shares, £1106 would remain to be carried forward. He might venture to anticipate a question from the shareholders as to why they did not pay another 1 per cent. upon the ordinary capital, seeing that they had a balance of £1106. The answer was that the market price of coal at the present time was at least 5s. per ton more than was paid under the Company's present contract, and the Directors would have to enter into a fresh contract before the next meeting of the shareholders. He did not know the extent of the additional price they would have to pay; but taking it at 1s. per ton on the 10,000 tons they used, it would amount to £500, and 3s. per ton would more than sweep away the whole of the sum carried forward. Under these circumstances, he believed the shareholders would concur with the Directors in the desirability of keeping the dividends uniform, and that there would be no question as to the propriety of retaining the balance referred to.

Colonel J. Le Geyt Daniell seconded the motion.

Mr. Dodgson expressed his gratification at finding that the Board had been able to secure as a Director a gentleman holding such a high position and having such a wide experience as Mr. Phillips. He also believed that the shareholders would one and all agree with the prudent course taken by the Directors in not increasing the dividend, with the prospect of having perhaps to reduce it again.

A Shareholder asked whether the Directors had considered the matter of extending the business by erecting other works.

The Chairman replied that, if any proposals were made to the Board which it would be to the interests of the Company to adopt, the Directors would give them the fullest consideration.

The motion was unanimously carried.

Resolutions were next passed on the motion of the Chairman, seconded respectively by Mr. Phillips, Mr. C. Newton, and Colonel Daniell, declaring a dividend of 7 per cent. per annum on the first preference shares, of 7½ per cent. on the second preference shares, and of 6 per cent. on the ordinary shares for the past year, deducting the payments already made on account.

Mr. Dodgson proposed, and Mr. R. Hesketh Jones seconded, the re-election of the Chairman, who was the Director retiring by rotation.

This having been agreed to,

On the proposition of Mr. J. Soutter, seconded by Mr. Sibson, Mr. Alfred Hersee was re-appointed an Auditor; as was also Mr. R. Hesketh Jones, on the motion of Mr. T. Guyatt, seconded by Mr. Westbrook.

The services of the Directors and officials were next duly acknowledged; and the proceedings then terminated.

WIDNES LOCAL BOARD GAS SUPPLY.

The Economy of the Dinsmore Process.

At the Meeting of the Widnes Local Board last Tuesday, the accounts of the gas undertaking for the year ending in March last were presented. They included items of extraordinary expenditure, to the amount of £1796; and they showed that the working for the year had resulted in a loss of £176. Mr. Brown, in moving the adoption of the minutes of the Gas and Water Committee, pointed out in regard to this loss, that it arose from the fact that there had been an extraordinary expenditure of £1796 upon the new retort-house and coal-store; these buildings having been erected under the supervision of their Engineer (Mr. Isaac Carr). The loss would have been a great deal more if they had not been using the Dinsmore process. The Board would remember that last year the price of gas was reduced out of the profits made. Since then the cost of coal had been high; but by means of the Dinsmore process they had been able to use inferior coal, otherwise they would have had to raise the charge for gas. They had also increased the illuminating power from 18 to 19½ candles, which would have cost, in the ordinary way, something like £500. The leakage of gas had been less during the past twelve months than in previous years, which was very satisfactory, as there was a theory that there would be a great loss by condensation in the Dinsmore gas. The loss through leakage had only been 5½ per cent., which was lower than in ordinary gas-works. He desired to point out that a great deal of this benefit was due to the foresight of their late Chairman, Mr. Gaskell. The minutes were confirmed. With regard to the loss of £176 on the working of the undertaking shown by the accounts, it should be pointed out that the expenditure on the retort-house and coal-store was an extraordinary charge. Leaving this out of consideration, an actual profit of £1619 was realized.

Reduction in Price.—The Lytham Improvement Commissioners have reduced the price of gas 2d. per 1000 cubic feet; the rate being now 3s. 4d., with 4d. discount to consumers paying their accounts within a month.

Featherstone New Water Scheme.—The Local Board of Featherstone held a special meeting last Wednesday to consider matters relating to the new water scheme for the district. From the brief report of the proceedings which has come to hand, it appears that everything is not going on exactly as could be wished. The Engineer (Mr. Paterson) stated that he considered the present contractor (Mr. Firth) had broken his contract; and that he had refused to guarantee the work when completed. The Board decided to relet the remaining portion of the work; and passed a resolution in which they expressed the opinion that Mr. Firth had failed to carry out his agreement. It was anticipated that the Wakefield Corporation would turn on the water in a few days, and hopes were entertained that the Featherstone reservoir would be in readiness.

ROCHDALE CORPORATION GAS SUPPLY.

Purification of Gas by Oxygen—Reduction of Prices in the Outlying Districts—The Coze System of Inclined Retorts.

At the Meeting of the Rochdale Town Council last Thursday week—the Mayor (Mr. W. T. Heap) presiding—an important report was presented by the Gas Committee on the subjects mentioned above.

The Committee stated that, at their meeting on the 7th ult., a letter was read from the Brin's Oxygen Company, stating that, as Rochdale was the first Corporation in the north to adopt an oxygen installation for the purification of gas, they would accept the altered terms of payment as follows: As to £2000—one-third on delivery of the plant, one-third on erection, and the remainder after one month's successful working. As to £1800—one-half on completion of the apparatus, and the balance after three months successful working. At a subsequent meeting of the Committee, on the 21st ult., it was resolved that the price of gas to consumers outside the borough, and used only for purposes other than lighting, should be reduced to 3s. per 1000 cubic feet. A Sub-Committee—consisting of the Chairman (Alderman Petrie), and Aldermen Baron and Tweedall, with the Engineer (Mr. T. Banbury Ball)—was appointed, at the meeting of the Committee on the 7th ult., to visit the Rheims Gas-Works and inspect the inclined retorts in operation there. On this matter, the report stated: "The Sub-Committee visited the gas-works at Rheims, where the inclined retorts were first put into practical use; and the Engineer of the Gas Company, who is the designer of this form of setting, explained the method of construction, and the advantages it offers over the ordinary plan of setting retorts. At the present time there are nine retorts in use, each 11 feet long; and these have been in actual operation about two years. Each charge consists of about 4 cwt. of coal, the retorts being charged every six hours; and one man attends to all the work in connection with them, except wheeling away the coke, and this he only takes just outside the retort-house. The weight of coal this man carbonizes is, therefore, 72 cwts. in twelve hours. Your Sub-Committee saw the retorts drawn and charged, and are unanimously of opinion that this is done well and expeditiously; the coal being evenly spread over the retort from top to bottom, and the coke easily withdrawn. The retort-house in which this particular setting is erected is not a stage house, and the coke has therefore to be removed from each retort separately. But in a stage house this need not be done, as the coke could be drawn into the vault and quenched and wheeled out between the charges. Having satisfied themselves on the practicability of this method of drawing and charging retorts, your Sub-Committee considered the question of relative cost. While there can be no doubt that the first cost of these settings is considerably in excess of the ordinary ones, the saving in labour for working them appears to more than counterbalance this extra cost. The Engineer of the Rheims Gas Company estimates the saving in labour at one-half; but this is naturally a sanguine estimate. If, however, a saving of 9d. per ton of coal only is effected, and this appears a very moderate estimate, the extra cost would be more than repaid during the life of the first retorts; and, of course, the renewal of them is little, if any, more expensive than the ordinary plan, and there would then be a saving on these five settings alone of upwards of £500 per annum. Since returning, your Sub-Committee have met and considered the estimated cost of erecting and working these settings, and unanimously recommend the Committee to sanction the expenditure which it is estimated that the erection of these five settings will involve—viz., £3500, and to authorize their being proceeded with forthwith."

Alderman Petrie, in moving the adoption of the report, remarked that it was some time since a reduction in the price charged for gas used for purposes other than lighting was made in relation to consumers within the borough; and as the outside consumers had expressed a desire for a similar decrease, the Committee took that as an intimation that they wished to use gas for heating purposes, and so had decided to reduce the price to them to 3s. per 1000 cubic feet. Perhaps the most important matter referred to in the report was the provision of new retorts at the works. Notwithstanding the rivalry of oil and electric light, the increase in the consumption of gas had become so great that the Committee found themselves obliged to prepare for an extension of the works; and as in the last few years great improvements had been made in various branches of gas manufacturing, they felt themselves bound to gain all the information they could, and to see the latest improvements before commencing the required alterations. While they were obtaining information, M. Coze's system of inclined retorts was brought before them. The Committee were so much impressed with the simplicity and beauty of the theory regulating the invention, that they felt obliged to investigate it thoroughly before beginning to erect new works on the old system. Inclined retorts were quite new to this country. They had been in use in France—at the works of the inventor, at Rheims—two or three years; but a large number of works were now about to try them. Having described the system in detail, he said the Sub-Committee, while at Rheims, saw the retorts in actual operation, and tested them as fully as possible; being highly pleased with the results obtained in every one of the experiments. They had no hesitation at all in unanimously recommending their adoption. What they proposed was the erection of five settings of the new retorts, at an estimated cost of £3500, on a piece of spare land at the end of the old retort-house. The Committee believed that the saving secured by adopting the new retorts, would, in the first season of their use, be equal to the extra cost of capital expenditure in erecting the settings; and after that, at a moderate estimate, the saving would be about 9d. per ton on the coal carbonized. As to the Committee's arrangement to use at the gas-works Brin's plant for the production of oxygen, he simply mentioned that he explained it at a previous meeting of the Council.

Mr. Sharp asked the expenses of the four gentlemen who took the long journey to Rheims, and whether the Committee were yet prepared to reduce the price of gas in general use outside the borough.

Mr. Wrigley inquired what was the extra cost of erecting retorts on the new as compared with the old system.

Mr. Cunliffe wished to know the length of time the Committee's coal contracts covered.

Alderman PETRIE said he had not the total cost of the deputation to Rheims before him; and he could not tell off-hand what it was. If Mr. Sharp would apply to the proper quarter, he would no doubt be able to get at once a full answer to his question. As to reducing the price of gas in general use outside the borough, the Committee were not prepared to make any such reduction at present; but he thought they would reduce the price as soon as they found it convenient to do so. The difference in the price paid for coal this year and last was exactly 3s. per ton. There was no arrangement made with the inventor of the inclined retorts as to making up any loss possible on their erection in Rochdale. The extra cost of erecting retorts on the new system was about 20 per cent. The length of time for the coal contract was twelve months; and the last order given to the contractor was for 35,000 tons—the quantity of coal used at the works last year.

Mr. SHARP was surprised to hear Alderman Petrie say he did not know what was the expense of the deputation visiting Rheims. Being Chairman of the Committee, he (Mr. Sharp) looked upon him as responsible for the money spent. He thought there ought to be some fixed regulations as to the cost of such deputations.

Alderman BARON agreed with Mr. Sharp as to the desirability of fixing the amount to be spent by deputations; and he should be glad if the Council could discover some practical method of doing so.

Alderman TAYLOR said he regarded the cost of the deputation to Rheims a very unimportant thing in view of the good their visit might secure for the town.

Mr. CUNLIFFE observed that a more important matter than the cost of the deputation, was the contract which the Committee had accepted for the supply of coal. In the present state of the coal market, it was a very undesirable thing to contract for a supply extending over such a long time as twelve months.

Alderman TWEEDALE said that, when the visit to Rheims was first suggested, he recommended the Chairman of the Committee and Mr. Ball to undertake it; but the Chairman did not care to go on such important business without some other member of the Committee. He had no doubt the deputation would result in great benefit to the Corporation; and he repudiated entirely the suggestion that it had been extravagant.

After further discussion, the subject dropped; and the report was adopted.

Increase in the Price of Gas at Taunton.—The Directors of the Taunton Gas Company announce that, in consequence of the large advance in the price of coal and other articles required in the manufacture of gas, the price will be advanced 3d. per 1000 cubic feet from the 15th inst. The discounts remain as heretofore.

The Gas Exhibition at New Barnet.—From the opening of the exhibition of gas appliances at New Barnet, on the 29th ult., as already noticed in the JOURNAL, down to its close last Thursday, it was followed by unvaried success. The exhibits attracted considerable attention; and Miss Garstin's lectures and cookery demonstrations had on all occasions attentive and appreciative audiences. The Company are to be congratulated on the result of their enterprise, which cannot fail to be productive of good results; and for these they will be indebted to the energy and ability displayed by their Engineer (Mr. T. H. Martin) in carrying out the general arrangements of the exhibition.

The Application for Electric Lighting Powers by the Sutton, Southcoates, and Drypool Gas Company.—At the meeting of the Parliamentary Committee of the Hull Corporation yesterday week, the electric lighting proposals contained in the Bill of the Sutton, Southcoates, and Drypool Gas Company were under consideration. The proceedings were private; but it is understood that a protracted and animated discussion took place on the measure, during which certain prominent members took strong exception to the powers sought, inasmuch as the Company could, by the Bill, pay interest on their electric lighting capital out of gas revenue. On the other hand, it was contended that the Bill simply enabled the Company to compete with electric lighting companies; and unless an agreement was come to between the Company and the Corporation for the supply of electric light in a district, the Bill would not be worth the paper it was printed on. Ultimately a vote was taken on the question; the Town Clerk being instructed to draw up a clause expressing the view that the Corporation should not be committed to acquiescence in the principle of payment of interest in the way stated. Attention was called to the fact that several clauses of the Bill empowering the Company to acquire electric patents, which were described as very dangerous when the matter was before the Corporation some weeks ago, had been entirely withdrawn.

The Pollution of the River Lea.—At the Edmonton Petty Sessions last Thursday, the Tottenham Local Board of Health appeared in answer to a summons, issued at the instance of the Lea Conservancy Board, for having, on certain days in the past month, allowed sewage to pass into the river, in contravention of the Lea Conservancy Act, 1868, and after twelve months' notice had been given to them to desist. Mr. Horace Avory, having stated the case for the Conservancy Board, Mr. M. Lush, on behalf of the defendants, contended that the right parties were not before the Court. He stated that at the time the notice was given the Tottenham Local Board had control of the sewage works; but that since then it had been transferred to a Joint Committee of the Tottenham and Wood Green Local Boards. He asked the Bench to rule in his favour on this point; but they decided to hear evidence first. Mr. W. C. Young having given the results of his examination of samples of the sewage matter taken at the outfall into the river, Major L. Flower, Sanitary Engineer to the Lea Conservancy Board, said he had always considered the Tottenham Board to be the authority responsible for the control of the sewage works, and that the Joint Drainage Committee simply acted under their direction. He believed about £49,000 had been spent on the sewage works; but still the sewage was not treated to his satisfaction. In the result, the Bench held that the Joint Committee were responsible, and dismissed the summons.

THE ELECTRIC LIGHTING MOVEMENT AT BROMLEY (KENT).

The Comparative Cost of Gas and Electricity.

At the last Meeting of the Bromley Local Board, a communication was received from Mr. H. J. Lansbury (acting on behalf of the Committee formed a few weeks ago, as already reported, for the purpose of carrying out a scheme of electric lighting in the town), asking the Board to give some definite expression of their views on the matter. The Committee, it may be remembered, have been interviewed by a representative of Messrs. Laing, Wharton, and Down; and this gentleman was desirous of knowing how the Board would treat the proposed scheme. Mr. Lansbury stated that the Committee were anxious to meet the Board in every way possible, and with this view they would themselves obtain way-leaves over private property whereon to run the electric lighting mains (over which it was understood the Board had no jurisdiction); but they were fully prepared to carry the conductors, when crossing roads, underground. He inquired, first, if the Board would support the movement. Secondly, should they object to the proposed means of conveyance of conductors, would they state their reason for such objection in view of the expressed opinions of eminent Counsel. Then, if the Board objected to having the district lighted from the mains over the housetops and thence down underground, perhaps they would say what means they would prefer. Lastly, would the Board be disposed to support the Committee in their application for a Provisional Order or Licence on terms to be agreed upon. The letter, in conclusion, asked the Board if they would receive a deputation on the subject. Some doubt being expressed by the members as to what was really required, the Clerk explained that what was asked was practically whether or not the promoters would have the support or the opposition of the Board before they applied for a Provisional Order. Mr. Payne thought the deputation should be received. Mr. Curtis, on the other hand, did not see any good in such a course; and he moved that the request contained in the letter be not complied with. Mr. Payne nevertheless persisted with his proposition, which was put in the form of an amendment referring the letter to the Lighting Committee, and agreeing to receive the deputation. Eventually, both motion and amendment were withdrawn; and, on the suggestion of a member, the Clerk was instructed to ask for further information.

The electric lighting movement is giving rise to much correspondence in the local newspaper. One letter, signed "*Audi alteram Partem*," ably deals with the question from a financial standpoint, and in a style which is rather above that usually met with in communications on technical subjects appearing in the provincial press. It therefore deserves notice. According to the statement of Messrs. Laing, Wharton, and Down's representative, incandescent electric lighting is cheaper than gas. This is a sweeping assertion; but the writer disproves it by a very few figures. He shows that a 16-candle incandescent electric lamp, when run at 100 volts electromotive force, takes 0·6 ampere. Then $100 \times 0{\cdot}6 = 60$ watts. Dividing 60 watts by 16—the candle power—we have 3·7 watts absorbed for every candle. The Board of Trade unit is 1000 watts; and these divided by 3·7 watts per candle give 270 candles as the resultant illumination from one Board of Trade unit. Bromley gas, with ordinary flat-flame burners, gives an illumination of upwards of 3 candles per cubic foot of gas consumed, Therefore, with a consumption of 1000 cubic feet, there would be 3000 candles light. But, taken roughly, 1000 cubic feet of Bromley gas are equal to 11 Board of Trade units. These, at 8d. per unit, would come to 7s. 4d.; whereas 1000 cubic feet of Bromley gas would cost 3s.—showing an advantage of 4s. 4d. in the case of gas. The electricians' representative gave 6d. per Board of Trade unit as his figure; though how he is going to produce the light at this price, as against 8d. in populous districts, remains to be seen. But, taking 6d., how, asks the writer of the letter, is this to be cheaper than gas? Using 11 Board of Trade units, at 6d. per unit, would cost 5s. 6d.; a 1000 cubic feet of Bromley gas would cost 3s.—a difference, light for light, of 2s. 6d. in favour of gas. In making his calculations, the writer compared gas with an electric lamp assumed to give the same light throughout its entire life. But he points out that, at the very most, an incandescent lamp will only last 1000 lighting hours, which, assuming an average use of 4½ hours per day, means that it will require renewing at the end of 222 days. He quotes Mr. W. H. Preece to show that an ordinary commercial lamp, consuming 3·54 watts per candle power when new, consumes 6·1 watts per candle power after working 900 hours; the mean absorption being 5·25 watts, against the writer's statement of 3·7 watts. Put the other way, it appears that the candle power of a lamp after working 900 hours is only 58·5 per cent. of the initial duty; and the mean value of a lamp is only 67 per cent. of that which it possesses when new. It therefore appears that, to work economically as regards the consumption of electricity and obtaining illumination, a lamp should not be used for more than 700 hours. The average annual lighting for inside purposes is about 1400 hours; and as a lamp is really wasteful and photometrically useless after 700 hours' working, it is evident that the lamps will require renewing twice each year. As the lamps cost more than 4s. each, their renewal becomes a very costly item. Of course, this is a matter which the electricians' representative did not mention. But assuredly it must be taken into account; and therefore the writer of the letter gives the following comparative statements—Electricity: 50 16-candle incandescent lamps burning 1400 hours each, absorbing 60 watts per hour, at 8d. per 1000 watts, £140; 70 new glow lamps at 4s each, taking the life of a lamp at 1000 hours, £14; meter-rent, at 10 per cent. on cost, 14s.; converter, at ditto, £1 19s.; main fuse, at ditto, 5s.; total, £156 18s. Gas: 50 lamps consuming 5½ cubic feet per hour, and burning 1400 hours, £57 15s.; meter-rent, 16s.—total, £58 11s. This shows again in favour of gas to the amount of £98 7s. per annum. And even with the figure of 6d. per unit, the saving by using gas is no less than £63 7s. In support of his case, the electricians' representative cited the premises of a tradesman in the town, who, he asserted, would effect a saving of £60 per annum by adopting the electric light. But the writer of the letter fails to see how this is made out. The

gentleman in question pays £130 per annum for gas, which means that he consumes 867,000 cubic feet. This, at 3 candles per foot, gives an actual illumination of 2,600,000 candles. To produce 2,600,000 candles by 16 incandescent lamps would absorb 9630 Board of Trade units; and as an incandescent lamp is worthless after passing 60 Board of Trade units, it follows that 160 lamps would require renewing, which at 4s. each would come to £30. The comparative value of the two illuminants in the case cited is shown by the following figures—Electricity: 9630 Board of Trade units, producing 2,600,000 candles, at 8d. per unit, £321; renewing 160 incandescent lamps, at 4s. each, £32; converter hire, £4; meter hire, £1 8s.; main fuse hire, 10s.—£358 18s. Gas: 867,000 cubic feet, producing 2,600,000 candles, at 3s. per 1000 feet, £130; meter hire, £2—total, £132. This shows that instead of saving £60 per annum by using electricity, the gentleman referred to would lose £226 18s. But even with the figure of 6d. per Board of Trade unit, the annual loss would be no less than £146.

THE BRISTOL TOWN COUNCIL AND ELECTRIC LIGHTING.

There was a long discussion at the Meeting of the Bristol Town Council last Tuesday, on a motion by the Mayor (Sir Charles Wathen) that the report of the Electrical Committee be approved. This recommended the Council to adopt, experimentally, the alternate current transformer system, as proposed by Mr. Preece, for lighting the area embraced within Clare Street, Corn Street, Wine Street, Broad Street, and High Street; and to authorize the Committee to advertise for tenders for the supply of electricity for 21 years. The motion having been formally seconded, Mr. A. Baker deprecated the spending of money on electric lighting experiments, as the light had passed the experimental stage. What they did, should be done on a larger scale; and it was important that the lighting should be in their own hands, and not left to a contractor. He urged the members not to repeat "the mistake" made in the past with regard to the gas and water supply; and allow a monopoly to be established in respect to electricity. He moved an amendment, referring the report back to the Committee. This was seconded; and then Mr. Barker expressed his opinion that, unless there was some special reason for adopting the limited area suggested, it was a small and unimportant way of dealing with a great question. He would therefore support the amendment. Mr. Lloyd likewise spoke in favour of referring the matter back to the Committee; and then the Council were reminded by Alderman Sir George Edwards that, when the limited area now suggested was first adopted, it was regarded in the light of an experiment. This, however, was ten years ago. The time for experiments had passed; and they had only to look to other towns to see that the electric light was an accomplished fact. He should support the amendment; for if the Council could carry a large scheme, he was convinced that in every respect it would be better. The Mayor stated that he had only accepted the chairmanship of the Electrical Committee for the purpose of pushing the matter on; and he at once repudiated responsibility for any delay which might have taken place. He considered that the decision of the Committee to follow the area specified in their Provisional Order of 1883 was a wise one. Alderman Jones was in favour of the introduction of the electric light; but he should like to know whether those who were supporting the amendment were aware of what outlay would be incurred in lighting the whole city. The Mayor remarked that, according to Mr. Preece's report, it would cost £300,000; but that the area within the five streets mentioned could be taken in hand for about £30,000. After further discussion, the amendment was carried by 33 votes to 5; and on the suggestion of Sir G. Edwards, some additional members were added to the Committee.

Sutton-in-Ashfield Water Supply.—About five years ago the Sutton-in-Ashfield Local Board constructed water-works for the supply of their district; and the water proved to be of such good quality that several adjoining Local Authorities desired to be supplied in bulk. The mains now extend over an area of 50 square miles; and the Local Board have just decided, on the advice of their Engineer (Mr. G. Hodson, M. Inst. C.E., F.G.S., of Westminster), to duplicate the pumping machinery and increase the yield of their well.

The Public Lighting of Winchester.—At the last monthly meeting of the Winchester Town Council, the principal question under discussion was a motion by Mr. Ward that a more efficient mode of lighting the streets should be substituted for the present system of oil-lamps, which he stigmatized as a disgrace to the city, and utterly behind the times. There was not much opposition to the motion; but some speakers contended that light for light the ordinary gas-jet was not superior to the oil-lamps in use, and the cost of the change would be almost double. The present was also considered an inopportune time for increasing the rates; but nevertheless the members resolved that the General Purposes Committee should report as to the expense of lighting by electricity.

The Proposal by the Cardiff Corporation to Purchase the Gas-Works.—In the course of a long letter dealing with this question, which appeared a few days since in a South Wales paper, Mr. Trounce, a member of the Cardiff Town Council, says: "The sum of £505,000 recommended to be paid for the gas undertaking of Cardiff, considering the additional heavy amounts which must be paid to develop the works, and considering further the circumstances associated with the present transition state of public and household lighting, leaves me no alternative but to believe that the transfer at such a fabulous price would be a municipal blunder of the veriest type. The idea also of offering such a sum for the gas-works, with its plant and material, without first of all obtaining an independent expert's report and valuation of the present condition of the property, and its capacity for the production of an increased quantity of gas, is, in my opinion, as inexplicable as it is inexcusable."

SOUTHWARK AND VAUXHALL WATER COMPANY.

The Half-Yearly Ordinary General Meeting of this Company was held last Tuesday, at the Offices of the Company, Southwark Bridge Road—Alderman Sir H. E. KNIGHT in the chair.

The SECRETARY (Mr. A. Jelley) having read the notice calling the meeting, and the minutes of the previous meeting, the report of the Directors for the half year ending March 31 last was presented.

The CHAIRMAN, in moving the adoption of the report, remarked that little of an interesting nature, to call for lengthened comment, had occurred during the half year covered thereby. The Directors had steadily pursued their work, and taken care of the interest of the proprietors by doing all that was necessary to maintain the position of the Company; and they were glad to be able to congratulate them on the general result. During the half year, the principal expenditure on account of capital had been on their 42-inch main, which would be brought into use within the next twelve months. The total charge for maintenance was £36,100, against £35,100 for the corresponding period last year. This increase was mainly accounted for by the advanced price of coals. But there was another cause—viz., the fact that during a part of the half year they were cleansing and re-making some of their filters at Hampton; and this necessitated the employment of their old engines, which did not perform the same amount of work for the expenditure of fuel which the new ones erected by their present Engineer (Mr. J. W. Restler, M. Inst. C.E.) accomplished. This would account for more than the difference in the totals; but there had been a saving on account of filtration. On the question of maintenance, he would like to offer a few explanations, because, on former occasions of their meeting together, some of the proprietors had called attention to the expenditure of the Company as compared with that of other London Water Companies. Although he had told them at a previous meeting that they had inquired into the matter, and had found no cause to complain, he thought they should again investigate the subject; and in doing so they discovered that the way in which certain charges and receipts in respect of their outlay were being treated was not quite satisfactory for bringing before the shareholders the real net cost of maintenance. They had made some slight alterations in the accounts, which in the next half year would remedy this condition of things, and would omit from the item of maintenance, charges connected with buildings, new supplies, and constant hydrants, which could not be properly charged to it. But when they compared this Company with the other London Water Companies, they must take into consideration facts which were not known to the general body of shareholders, but which it was the business of the Board to know. In order to put the shareholders in possession of them, he would submit a few figures which had been worked out by the Secretary on the bases of percentage in respect to the number of houses supplied and of receipts for water-rents. It ought to be understood that their's was a peculiar district. The great bulk of their water-rental was received from small houses. It was a very different thing, in regard to maintenance, to collect rates averaging 30s., and those averaging from £30 to £80. They had a great number of supplies for a very small amount of revenue. He might mention that among water companies the percentage of maintenance varied from 45·9, or 9s. 2d. per house, to 24·3, or 4s. 10d. per house, which was the lowest. The figures of their Company stood at 29·8 per cent., or 6s. per house; so that testing it by these figures, their expenditure was the lowest but one of all the London Water Companies. Let them take another test—that of management charges, on the basis of the number of houses. He found that the percentage on this account varied from 13·6, which was the highest, to 5·7, which was the lowest. The Southwark and Vauxhall Company's figure was 5·8, or 1s. 2d. per house; the highest being 2s. 9d. Applying both tests, he thought the shareholders would agree with him that the Company came out very well. Taking it on the water-rental, he found that the percentage for maintenance varied from 36·6, the highest, to 23, the lowest. In this case the Company had the unenviable position of being the highest. This was accounted for, as he had already explained, by the great number of small houses they had in their district. As to the management, taking the same percentage, he found the highest was 7·4, and the lowest 5·3, while that of the Southwark and Vauxhall Company was 6·1. So that he thought these figures, which his co-Directors had been desirous of placing before the shareholders, would convince them that their position was quite satisfactory. There was the coal question. During the agitation and threatened strike in the coal trade, the Directors were in this position—that if there had been a strike, their supplies would have been exhausted in two or three weeks; and then what would have become of the water supply of London. However, they succeeded in laying in a store of coals sufficient to last for six weeks. He thought it was a sad thing that those who agitated for industrial changes should not take such contingencies into consideration. Their management expenses had been the same as they were the year before; but he was happy to say that their water-rents amounted to £105,249, as against £103,373 for the corresponding period of last year; showing a progressive and gratifying increase in the Company's business. This amount left them with a balance of £42,000, as against £40,000 in the corresponding half of 1888-9, and would enable them to pay their dividend of 6 per cent., and carry forward £2000 more than they did last year. This result was specially satisfactory, because they were now dealing with the worst half year, inasmuch as in the six months ending in September, as he had often explained, there was an increase of revenue from water supplied for gardens and other contingent circumstances. Having offered some explanation of the item of the deposit account, £53,000, in the statement of assets and liabilities, the Chairman referred to the loss the Board had sustained by the death of Mr. Alderman Stone, whose place had been filled by the appointment of Mr. Samuel Green, who had for years taken great interest in the affairs of the Company, and was in every way entitled to the confidence of the shareholders. The Bills in Parliament had taken up a great deal of the Directors' time and attention. They were crude to an extraordinary extent, especially those promoted by the London County Council. They had been withdrawn; but he had not the slightest doubt they would be brought forward in some form or another next

year. He hoped, however, that they lived in times when fair consideration would be given to all matters affecting the interests of large bodies of shareholders, before any rash legislation to their detriment was carried into effect. They had not proposed an increase of dividend, though they had earned more money, because they knew there were extensive works yet to be carried out. But there was not the slightest doubt that the time would come, if nothing unforeseen occurred, when they would be in a position to gradually increase their dividend.

Mr. C. M. VIALLS seconded the motion and it was carried unanimously.

The CHAIRMAN, having referred in terms of high praise to the admirable way in which the Engineer, Secretary, and officers had performed their several duties, moved the payment of a dividend at the rate of 5 per cent. per annum on the preference stock, and of 6 per cent. per annum on the ordinary stock and class "D" shares of the Company.

Mr. VIALLS seconded the motion, which was carried *nem. con.*

Dr. E. CHESSHIRE moved a vote of thanks to the Chairman and Directors; paying a warm tribute to them for the successful manner in which they conducted its affairs. Referring to the Bill introduced into the House of Commons on the previous night, he expressed the hope that they would keep a watchful eye on any legislative attempts that might be made to interfere with the rights of the Company and its method of charging.

The motion was carried unanimously.

The CHAIRMAN, in returning thanks, assured the shareholders that although he knew nothing of the Bill alluded to, everything that affected the Company would be closely watched by the Board.

The proceedings then terminated.

GRAND JUNCTION WATER-WORKS COMPANY.

The Ordinary Half-Yearly General Assembly of this Company was held last Wednesday, at the Offices, No. 65, South Molton Street—Mr. E. G. FOX in the chair.

The SECRETARY (Mr. J. W. Fisher) having read the notice convening the meeting, the Directors' report and the statement of accounts for the half year ending March last were presented.

The CHAIRMAN remarked that, taking the accounts as they stood, the proprietors would see that they had to deal with an increased expenditure for coals. So long as their contract lasted, it was very useful. The last time he had the pleasure of addressing them, he stated that the Directors had provided for themselves in this respect. That, however, was only in reference to the strike on the Thames; and the increase of expenditure to which he now referred was due to colliery strikes. They had had to pay £970 more for their coal in the past half year than before; and there was also an excess of £365 in taxes. These were matters not under their control; but everything that was, he thought, would be found pretty much the same as hitherto. The accounts had been certified to by the Government Auditor, as well as by their own Auditor, as being correct; and the dividend that would be declared was 9 per cent. upon the original shares. The revenue account showed that they had had a loss of a good deal more than £1000 in coal and other things, as compared with this time last year. Coming to the Company's works, the several stations had been inspected by the Directors, and found in excellent order. The large reservoir at Ealing was now thoroughly completed and effective; and there was no settlement at all in it. It was a very fine piece of work, and one of which their Engineer (Mr. A. Fraser, M. Inst. C.E.) might well be proud, as the Directors themselves were. It gave them storeage room which he believed few other companies possessed, in addition to which they could supply water at 190 feet above the level, and they had the means of going 50 or 60 feet higher. They could thus charge the mains in case of fire. Then they had a large neighbourhood springing up all round this very high level; and they were enabled to give it a very high service indeed. With regard to the works at Hampton, the intake had been very successful, and the machinery they were now erecting would give them all they required in the way of power. Having completed the extension of their storeage and their pumping power, they felt themselves quite equal to any emergency. It would be remembered that, this time last year, leave was given to the Directors to raise £50,000, besides £15,000 on debentures. He was pleased to say that they had spent only £20,000 of the former amount, and had not touched the debentures; and he thought they would get out of debt, or very nearly so, in regard to their works at the present time. They had increased by 366 the number of houses supplied on the constant system, which had given great satisfaction to everyone, especially to the consumers and all the sanitary officers in their district. The number of houses thus supplied was now 44,211. Having referred in terms of regret to the loss the Board had sustained by the death of Mr. Alfred English, whose knowledge as a practical engineer had proved of great assistance to the Directors, the Chairman mentioned that Mr. Charles Horsley, Mr. Walter Hunter, Mr. William Harrison, and Mr. Samuel Green had offered themselves as candidates for the vacant seat. He concluded by moving—"That the report of the Directors and statement of accounts be approved and confirmed, and that the recommendations contained therein be adopted."

Mr. J. W. COOPER seconded the motion.

Mr. W. S. JONES called attention to the Bill which had just been introduced by Mr. Causton into Parliament to regulate and limit the powers of the Water Companies of the Metropolis in respect to their charges, and asked the Chairman if he could give any information about it.

The CHAIRMAN, in reply, said it had only that morning been brought to their notice, and they had given instructions to their Solicitor to l o'c after it. They would attend, with the Chairmen of the other Water Companies, a meeting on Friday; and the proprietors might depend that the interests of the Company would be taken care of.

The motion was then carried unanimously.

The CHAIRMAN next moved—"That a dividend for the last financial half year at the rate of £9 per cent. per annum upon the ordinary share capital of the Company, and of £7 10s. per cent. per annum on the £25 "C" shares, and of £7 per cent. per annum upon the new ordinary £50 shares, together with interest in accordance with the conditions of sale on payment on the shares issued in February, 1890, be now declared."

Mr. COOPER seconded the motion, and it was carried unanimously.

The retiring Directors and Auditor having been re-elected, Mr. C. Horsley, J.P., was chosen to fill the vacant seat at the Board; the other candidates having withdrawn in his favour.

The proceedings then terminated.

CHELSEA WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices, Commercial Road, Pimlico, last Thursday—Sir W. H. WYATT in the chair.

The SECRETARY (Mr. G. H. Gill) having read the notice calling the meeting, and subsequently the Official Auditor's report, and that of the Company's Auditors, the report of the Directors was presented.

The GOVERNOR, in moving the adoption of the report, said he thought no more gratifying statement of accounts had ever been submitted to the proprietors since he had been a Director of the Company than the one before them; and the more they made themselves acquainted with its details, the more would they find it to be in every way satisfactory. The income was increasing, and so also were the expenses; but the latter arose from the advanced price of coal. Had it not been for this circumstance, he believed they might very possibly have paid another ½ per cent. dividend. On the other hand, it should be remembered that the former price of coal was exceedingly low. Therefore they had not much to complain about. They had over-spent the capital account by about £9000. But they were able to do very well without raising any fresh capital at present; and they were very anxious not to have any more upon which to pay dividend as long as they could do without it. The quantity of water pumped had been increasing, and continued to do so; but, of course, if they had fresh supplies and additional customers, they must expect the quantity of water to increase. The Directors intended to see if it was possible, by a still more efficient inspection of the waste, to reduce somewhat the quantity of water pumped. The plant, machinery, and buildings had all been recently inspected by the Directors, who had been very pleased with the condition in which they had found everything. Great credit was due to their Engineer for the evident care with which he was attending to his duties. He thought that the more troublesome of the parliamentary measures had been disposed of. There was an inquiry going on in the City on the question of water supply; but he did not see how it could affect the Company, as they did not serve the City. A Bill had been introduced into Parliament by Mr. Causton, to regulate the Water Companies. How the honourable gentleman proposed to do this, it was not possible for him (the Governor) to say, as the Bill had not yet been printed. The coal difficulty had been a very serious matter to them, and had cost them a great deal of money in the past, and, he feared, would cost quite as much, if not more, in the future. They had entered into favourable contracts which would carry them on up to Sept. 30; but what price they might have to pay after that, they did not know. They would pay the dividend recommended out of the half-year's earnings, and there would be a further sum of £200 placed to reserve; so that they were not encroaching on this fund at all, which was a very satisfactory point.

The DEPUTY-GOVERNOR (Mr. F. S. Clayton) seconded the motion.

The GOVERNOR, in answer to questions, stated that the reserve fund, to which he had referred, amounted to £24,000. It consisted of undivided profits which they might employ at any moment for dividends. The reserve fund was not a contingency fund. As to Mr. Causton's measure, nothing could come of it this session.

The motion was carried unanimously.

Resolutions were afterwards passed authorizing the Directors to provide for the payment of the dividend due on the 5th prox. on the several preference stocks, approving the dividends recommended on the ordinary capital stock of the Company, and re-electing the retiring Directors and Auditors.

A vote of thanks was then accorded to the Governor and Directors, and the proceedings terminated.

The Burton-upon-Trent Corporation and Electric Lighting.—Our readers may remember that the Burton-upon-Trent Corporation are contemplating the establishment of works for supplying the electric light in the town. With the view of obtaining some idea of the extent of the plant that will be required, the Gas Engineer (Mr. F. L. Ramsden) has issued circulars to the inhabitants, asking them to state, in the event of their being desirous of adopting the new system of lighting, the nature of the premises to be supplied, the number of lights required, and the probable length of time the supply would be needed. If the demand for the light is limited, the price of 8d. per Board of Trade unit will have to be charged; but, of course, this may be reduced after experience of the working of the new system. The above-named figure is equal to about 6s. 8d. per 1000 cubic feet of gas, against the present prices of 2s. 10d. to 4s. 6d. In addition to this, 15s. per annum will be charged for meter-rent. As, after about 1000 hours' use, incandescent lamps require renewal, at an outlay of 4s. each, this will be a further item of expense. The cost of wiring the premises will have to be borne by the consumer; but the Corporation will, as in the case of gas, carry the service lines free of charge to the buildings, except where these stand back some distance from the footway. The expense of the interior fittings will necessarily depend upon the style of lamps, &c., adopted; but this will certainly come to 25s. per lamp. Mr. Ramsden's circular shows that the Corporation are willing to supply the electric light if there is a desire for it on the part of the inhabitants; but he is determined that they shall not do so in ignorance of the outlay it is likely to entail.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday.*

The Perth Gas Commissioners have just closed an exceedingly satisfactory year. The annual meeting of the Commission was held on Monday night, when the income and expenditure for the past year, and the estimates for the current year were submitted. From the statement as to the past year, it appeared that the expenditure was: Coal, £6145 17s. 8d.; lime, £224 12s. 7d.; wages, £2590 3s. 10d.; salaries, £688 10s.; repairs and changes, £561 5s. 3d.; meters and furnishings, £235 14s. 9d.; main and service pipes, £177 19s. 8d.; feul duties and taxes, £972 15s. 11d.; annuities, £2812 10s.; interest, £393 19s. 3d.; and charges for printing, &c.—making up a total cost of £15,029 13s. 9d. A sum of £1000 is required to be set aside for the sinking fund; and bad debts amounted to £63 18s.—making the total expenditure £16,093 11s. 10d. The revenue consisted of: Gas and meter rental (less discounts amounting to £276 15s.), £13,516 18s. 2d.; naphtha, £819 8s. 9d.; tar, £105 1s.; coke, £863 12s. 11d.; and rent of property, £70—making £15,375 0s. 10d., and, with a balance of £1500 from the previous year, a total revenue of £16,875 0s. 10d. On the year's working there was a surplus of £345 7s.; which, with the £1500 from last year, less bad debts and contributions to sinking fund, left a surplus of £781 9s. The sinking fund now stands at £4300; and during the year there was applied to the contingency and depreciation of works account a sum of £1620 13s.—leaving it at £959 6s. 4d. This satisfactory state of matters has been arrived at in face of a reduction in the price of gas of 2d. per 1000 cubic feet. The revenue for the previous year was £15,683; and in the year before that, with gas 5d. per 1000 cubic feet dearer, it was £16,242. The assets were stated at £69,150 8s. 3d.; and the liabilities at £63,109 12s. 11d. In presenting the accounts, Bailie Bridges said they had received £601 more than they estimated. The increase had been entirely in the gas-rental. They estimated to make 74,550,000 cubic feet of gas, to produce £12,819 9s. 2d.; and the quantity actually carbonized amounted to 85,716,100 cubic feet—the quantity supplied to consumers in Perth and Scone being 78,697,380 cubic feet. That was the largest increase they had ever made—viz., 6,000,000 cubic feet; and notwithstanding that the price of gas had been reduced by 2d., which amounted to £700, the gas and meter rental was £173 better than it was last yer. A decrease of £80 11s. 3d. had been sustained on the naphtha returns through loss of time in connection with the operations at the gas-works. The total expenditure was estimated at £14,498 10s., and the actual expenditure was £15,029 13s. 9d., accounted for by an increase in the make of gas, necessitating the carbonizing of 8014 tons of coal, or 414 tons more than had been estimated for, at a cost of £6141 17s. 7d., as against £5890 estimated. On the wages there had been a considerable rise; the estimate having been £2300, and the actual sum £2590; or an increase of £290, due to a rise in wages all round of about £150, to extension repairs, and to the want of storeage, necessitating extra coal-trimming. On the whole, the accounts were very satisfactory, as they had estimated for a balance of £775 19s. 2d., and had realized £845 7s. 1d. With respect to the estimates for the coming year, they estimated £7240 4s. for the coal account, which, roughly speaking, was £1100 over that of last year, or equal to more than 3d. on the gas-rental; and had they not had 2453 tons of coals available upon previous contracts, it would have been much more. Wages they estimated at £22 less than last year. They reckoned that 80,000,000 cubic feet of gas would be produced, representing an increase on the previous year of 1,300,000 cubic feet. They proposed to put 2d. per 1000 feet on the price, which would produce a rental of £14,687 10s., as compared with £13,516 18s. 1d. for last year; and they expected a total revenue of £17,044 4s. Notwithstanding that some of the qualities of coals were not the same as last year, they had no intention of reducing the illuminating power of the gas. It was resolved that the price of gas should be 3s. 6d. per 1000 cubic feet; and, in reply to a question, Bailie Bridges said they were not in a position at present to abolish meter-rents, but that he hoped next year they would be able to consider the matter.

The Dundee Water Commission met yesterday to receive the accounts of the Commission for the past year. Bailie Craig, Convener of the Finance Committee, reported that the income was £44,645 3s. 11d., which was £1619 18s. 2d. more than was estimated for. The expenditure was £41,993 9s. 10d., which was £956 10s. 2d. less than was estimated at the beginning of the year, and left a surplus of £2651 14s. 1d. On the revenue side, they received £17,343 2s. 7d., or £343 2s. 7d. more than they estimated, which was due to an increase of £670 in the rental of the city. Special and meter rates were reckoned at £22,100; and they had yielded £23,349 11s. 5d., or £1249 11s. 5d. over the estimate. This increase was almost entirely due to meter-rents, and showed that the trade of the city was flourishing. On the expenditure side, interest was less than the estimate of £17,150 by £355 8s. 9d., which was due to the practice of Mr. Smith, the Treasurer, of lending money to the other large spending departments in the city. For the maintenance of the Lintrathen works, the estimate was £655; but they had had a troublesome, unreliable pipe in the valley of Strathmore, which was every year becoming dearer to them, and their actual outlay was £826 6s. 2d. Speaking of the subject of taxes, Bailie Craig said: "It is one of the resources of civilization for the strong to oppress the weak; and these taxes are a means of helping to hinder and harass a community seeking one of the chief necessaries of existence. There should be at least a new and more liberal reading of clause 6 of the Lands Valuation Acts, so far as they are applicable to corporation water-works. A sum of £3361 17s. was paid for taxes last year—in many cases to parishes where our mains enter at one end and leave at the other end of the parish; and there is no visible sign of our works, only the knowledge of the fact that we spent thousands of pounds in laying down a pipe to convey to us a plentiful supply of pure and wholesome water." The debt of the Commission was at present:—In debenture stock, £363,900, and mortgages, £122,503 0s. 4d.; total, £486,403 0s. 4d.—being £2830 below what it was last year. This result had been arrived at through the indebtedness of the revenue account to the capital account being reduced by over £600, and a bank balance of nearly £4000 being applied to debt extinction. Besides that debt of £486,403, there had to be added £329,245, being the amount of annuities capitalized at 23 years' purchase. The amount set aside out of revenue for the sinking fund was £2560, the total paid into this fund being now £23,945 12s. In the conversation which followed Bailie Craig's statement, complaint was made that the rate for trade purposes was so high as 7d. per 1000 gallons, particularly as there was a profit of £1200 from meter-rents; and to this it was explained that in 1892-3 they would have to increase their payment into sinking fund from £2560 to £5800, that seeing it was the domestic rental which was mainly responsible for the water-works it should have their first consideration, and that they had the near prospect of an increased capital expenditure upon the extension of their second line of piping from Pitnappie to Clatto. Attention was directed to what was called the pleasing fiction of capitalizing their £14,315 of annuities at 23 years' purchase, making their annuity debt £329,000 when the annuities sold in the market at 30 years' purchase, and their debt on that head was in reality £429,000. It was remitted to the Works and Finance Committee to prepare estimates of revenue and expenditure for the current year. Last Wednesday the Commission made an inspection of their water-works at Lintrathen.

From our Glasgow Correspondent.

GLASGOW, *Saturday.*

The make of gas at the three works of the Glasgow Corporation Gas Trust during the month of May, amounted to 150,811,000 cubic feet, as compared with 141,705,000 feet in the corresponding period of last year. These figures show that there was an increase to the extent of 9,106,000 cubic feet—rather more than 6½ per cent.

With the 31st of May, the financial year of the Gas Trust came to a close; and now, in the various departments of the Gas Office, the returns for the year are being made up for the annual report, which will in due course be laid before the Corporation Gas Commissioners. It will yet be some time before they can be got ready; but I am now able to give the total production of gas for the twelve months—namely, 3,058,277,000 cubic feet, against 2,905,796,000 feet in the year 1888-9; so that there has been an increase over the year amounting to 152,481,000 cubic feet, or almost 5¼ per cent. Considering the extent to which electric lighting has been adopted in the Glasgow gas-supply area, such an increase for the year must be regarded as highly satisfactory.

For the extensions now in progress at the Tradeston Gas-Works, the Glasgow Corporation Gas Committee have ordered two sets of Messrs. Kirkham, Hulett, and Chandler's "Standard" washer-scrubbers; each set having a daily capacity of 2,500,000 cubic feet of gas. I am told that their cost is to be between £1600 and £1700.

I think attention should be directed to the interesting fact that the Glasgow Gas Trust has now attained its majority, as it was called into existence by Act of Parliament passed in 1869. There are still a number of persons in the service who were "taken over" in that year, when the two Gas Companies then in existence were "disestablished" by the Act which created the Trust; and the only prominent "outsider" who has been in the service during the 21 years' life of the Trust is Mr. W. Foulis, the General Manager and Engineer-in-Chief.

Many persons up and down the country who are connected with the gas industry, and have the pleasure of knowing the gentleman, will be extremely sorry to learn that Mr. Peter Watson, who has been for many years the Manager of the Stirling Gas-Works, met with a very severe accident yesterday. Early in the forenoon, along with several workmen, he was engaged in removing a glass roof from a store-room at the gas-works. He overbalanced himself and fell through to the floor, a distance of some 10 feet. When picked up, he was severely stunned; and, on undergoing a medical examination, it was found that he had broken his right wrist and splintered his left thigh-bone. He was conveyed home and attended to by a medical man. The last report that I have received from Stirling states that Mr. Watson is doing as well as can be expected. He is a very heavy-bodied man; and therefore it is almost a marvel that, after falling from such a height, he did not receive more severe personal injury.

The annual meeting of the Milngavie Gas Company was held last Tuesday evening—Mr. William Blackwood, of Craigton, Chairman of the Company, presiding. A report from the Directors stated that the Works Committee had inspected the works, and found everything in good order. A year ago the price of gas was reduced 5d. per 1000 cubic feet—from 4s. 9½d. to 4s. 4½d.; and the result had been that the income showed a falling off to the extent of £131. No further reduction in price is to be made for the present. This is a somewhat prosperous concern. In 1860 the make of gas was 2,437,320 cubic feet, increasing to 3,266,250 feet in 1870, to 4,589,040 feet in 1880, and to 7,330,490 in the year 1889-90. The production has just doubled itself in twelve years. There are 14 miles of piping, and the loss from leakage is 13·6 per cent. In 1850, when the Company was formed, the price of gas was 8s. 4d. per 1000 feet, at which it remained till 1875. Then for a year it was 6s. 8d., and till 1883 it remained at 5s. 10d., then at 5s. 5d. till 1887, when it was reduced to 4s. 9½d., falling last year to 4s. 4½d. per 1000 feet. For a number of years there were meter-rents ranging from 2s. 6d. to 1s. 6d. These have been abolished within the past two years. Discounts are allowed to consumers, which range from 5 to 15 per cent. In the past year the consumption was 166,530 cubic feet greater than in the preceding year. The usual dividend of 7½ per cent. on the capital was declared at the meeting of the shareholders. Mr. Blackwood and Colonel Lagan were unanimously re-elected Chairman and Vice-Chairman, respectively; and the other Directors were also re-elected. Much of the prosperity of this concern is due to the able and obliging Manager (Mr. Learmont), who has been in the service of the Company upwards of thirty years.

Between ten and eleven o'clock on Wednesday forenoon, John Waugh, aged 76, a miner, who had resided alone in a house at Carronshore, near Falkirk, since the 28th of May last, was found dead in bed. There was a strong smell of gas in the room in which he was lying; and on examination it was found that this was due to a break in the joint of a gas-pipe near the window. Death is understood to have resulted from gas-poisoning. It is believed that the gas had been for a long time disconnected from this house; but it is thought

that the plugging of the pipe had given way, and so allowed the escape to take place.

Yesterday week the shareholders of the Largs Gaslight Company held their annual meeting—Mr. James Anderson, Chairman of the Company, presiding. A dividend of 6 per cent. was declared. The retiring Directors were unanimously re-elected; and the sum of £30 was voted to the Directors for their past year's services.

The Gas Residual Products Company have agreed to take the tar and liquor made at the Ardrossan Gas-Works at 20s. per 100 gallons.

The Glasgow pig iron market opened flat on Monday, but subsequently improved a little. At the close yesterday, Scotch warrants were quoted at 44s. 3½d. per ton cash buyers; hematite iron at 50s. 2d.; and Cleveland at 40s. 10½d. per ton.

In most departments of the coal trade there is a fair amount of activity, and prices are being well maintained.

The sulphate of ammonia market this week has again been quiet, with plenty of sellers but few buyers. The Continent still holds off, both for prompt and forward; and a sort of general depression seems to have come over the trade lately. Business is said to have been done at £11 f.o.b. Glasgow; the same seller offering thereat for Leith.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June* 14.

Sulphate of Ammonia.—The course of the market this week has not been of a satisfactory nature. The very low prices quoted by dealers, together with the reduced rates for London makes, are still causing intending buyers to hesitate with their purchases; and the actual business transacted has been of very limited extent. Under the circumstances, quotations at Hull and Leith are more or less nominal—the former port at £11 2s. 6d.; and the latter, £11 1s. 3d. Shipments from Liverpool continue on a very fair scale; and the few parcels offered locally have found a ready sale at equal to £11 2s. 6d. to £11 5s. f.o.b. A large number of cargoes of nitrate arriving at port of call, it was generally thought that a decline in price would supervene; but so strong is the opinion that present purchases will eventually prove remunerative, that the whole of the arrivals (some 40,000 tons) have been disposed of at 7s. 10½d. to 8s. per cwt.; and there are still buyers at the latter figure. Value on spot is slightly higher at 8s. 1½d. per cwt.

LONDON, *June* 14.

Tar Products.—These are still without animation. Benzol, 90 per cent., is at 3s. 9d. to 3s. 10d. per gallon; 50 per cent., 2s. 9d. per gallon. There are sellers rather than buyers at these prices. With regard to pitch, the shipping season being over, prices are purely nominal. There is nothing doing in anthracene; but it has more interest than other tar products, in view of alizarine contracts for 1891 being likely to command attention very shortly. It is now clear that the production of anthracene is not in advance of the consumption—in fact, it is rather a question whether the opposite is not the case; and there should be every reason to expect a rise in this article. This would be welcome not only to tar distillers, but also to alizarine makers, as the unremunerative low price of alizarine for some time past has, in the opinion of many persons, been caused by the uncertainty of the anthracene market, and the injudicious manner in which the product has been marketed. A steady price for anthracene would alike be a boon to consumers and producers. If the large producers would recognize this fact, they would undoubtedly profit thereby, and at the same time be doing good to their customers; and alizarine manufacture would again be a source of profit.

Sulphate of Ammonia.—A considerable business has been effected since our last report, at prices varying from £10 17s. 6d. to £11 2s. 6d. per ton. The latter figure may now be taken as the market value.

*** In the report on Tar Products last week, the advance on creosote was, by a misprint, given as 1s. 4d., instead of ¼d. per gallon.

Visit of the Birmingham Corporation to the Vyrnwy Water-Works.—On the invitation of the Mayor (Mr. Clayton), the members of the General Purposes Committee of the Birmingham City Council, and several of the principal Corporation officials, accompanied his Worship last Tuesday on an interesting excursion to the Vyrnwy Water-Works of the Liverpool Corporation. On their arrival at Vyrnwy, luncheon was served; and subsequently, through the kindness of the Mayor of Liverpool, the Birmingham visitors were conducted over the whole of the works by the Engineer (Mr. G. F. Deacon).

The Northern Coal Trade.—The coal trade has been influenced of late by several local strikes, which have created a temporary and artificial scarcity of gas coal. Steam coal is now at about the height of the exporting season; and thus all the collieries are fully working, and in some cases with very heavy orders ahead. The price is still about 13s. per ton, free on board. In winning this best steam coal, there is produced a larger quantity of small steam coal; and the price of this is reduced by the more abundant supply—about 7s. 9d. free on board being now the price for best small steam coal. In gas coal the demand is good, especially for export. But some of the southern gas companies also seem to be stocking coal; and thus, with certain large collieries laid idle by strikes, gas coal is scarce. The price is about 13s. free on board; and it is now evident that some of the collieries are behind with their contracts, through the restricted production. The demand of the miners for a further limitation of the hours of actual work may tend to a still shorter production, in which case there would be almost certainly a higher price for gas coal in the depth of next winter. Bunker coal is very dull; the poor condition of the iron trade having thrown much coal on the market and brought down the price of that used in steamships to about 9s. 6d. per ton—a considerable reduction. Household coal is extremely flat; the use of gas-stoves in many households limiting the consumption of this class. For blast-furnace coke, the inquiry is limited, and the price weaker—about 19s. per ton—for coke delivered free on board. For gas coke, the demand continues good; and as the output is less, the stock is limited.

A Reduction of 5 per cent. gross in the price of tubes and fittings has been announced by Mr. J. Aird, of the Wellington Tube Works, Great Bridge, Staffordshire.

Wallasey Water Supply.—Speaking at the last meeting of the Wallasey Local Board on the sanitary arrangements of the district, Mr. Walmsley incidentally mentioned that it had been found necessary to seek another source of water supply at a cost of £2000; and after the water had been found, a further £20,000 would have to be spent in constructing new works.

Freshwater and Yarmouth Water Company.—The Directors of this Company, which has been started for the acquisition of the Freshwater and Yarmouth Water Order of 1887 (under which power is given to construct and maintain water-works for the supply of Freshwater, Yarmouth, Thorley, and Shalfleet), have announced their intention of issuing 700 shares of £10 each to constitute the capital of the concern.

Extensions at the Rochester Water-Works.—Mr. J. D. Harris has reported to the Local Government Board that he has held an inquiry at Rochester into the proposal of the Corporation to raise £6000 for the purpose of duplicating the machinery at the Strood Water-Works. Since 1880 the Corporation have borrowed, under the sanction of the Local Government Board, £6550 for the purpose of improving the works; but such has been the development of the neighbourhood that a further extension is absolutely necessary to avert a breakdown in the service. The sanction of the Board will be given.

Improvements at the Neath Gas-Works.—The Neath Corporation, acting upon the advice of their Engineer (Mr. R. A. Browning, Assoc. M. Inst. C.E.) have lately decided to renew the whole of their beds of retorts on the regenerator system, similar to those put in last year. One of the beds erected had the Dinsmore patent process applied to it; and this is working well and giving very good results. New condensers and a catch purifier are also being erected. The plans have been prepared by Mr. Browning, and the contracts placed with Messrs. R. and J. Dempster, of Manchester, who carried out the erection of the new beds of retorts last year.

Proposed Abolition of Gas Deposits and Reduction in Price of Gas at Burnley.—At a meeting of the Gas Committee of the Burnley Corporation last week, it was decided to recommend the Town Council at their next meeting to abolish the deposit system and reduce the price of gas 1½d. per 1000 feet. It was resolved to recommend the Council to reduce the meter-rents two-thirds. The present price of gas is 2s. 3d. per 1000 feet; the meter-rents, which are now 3s. in cottage houses, will be reduced to 1s.; and the 5s. deposit on putting on a supply of gas, will be done away with. The profit on last year's working was £9000; and it is this large amount which has induced the Committee to offer the proposed relief to consumers.

The Oil Lighting at Erith.—Messrs. Defries have sent a letter to the Erith Local Board pressing for payment of the claims made by them for repairing lamps which were alleged to have been wilfully damaged, and intimating that if the claims are not met, they will proceed for their recovery by issue of a writ. By the agreement, the contractors are liable for all repairs except those caused by wilful damage. The Board consider the onus of proof as to this rests with the contractors; and a reply has been made to the effect that the Defries Company "must adopt what course they think best in the matter." This means more work for the lawyers, some of whose costs must come out of the rates—thus minimizing the difference between the cost of oil and gas.

The South Staffordshire Water Company's Supply.—The Medical Officer of Sedgley has called the attention of the Local Board to the fact that the districts of Rinton and Cooper's Hill and other places are without a proper supply of water; and the Local Board have decided to communicate with the South Staffordshire Water Company, who have the right of supply over the area, to ask them to remedy this state of affairs. The Company some eighteen months since proposed constructing a reservoir at Beacon, for the purpose of improving the supply to the district; but, although they acquired the necessary land, they have not taken any further steps in the matter. If the village is not now furnished within a reasonable time, the Board will ask the Sanitary Committee of the County Council to move in the matter.

The Birmingham Gas Workers' Society.—Owing to the increase of the number of members, it has been found desirable to divide this Society into separate lodges, in order to facilitate the ordinary work and to localize interest in its operations. The gas workers have affiliated with the Trades Council; and it is anticipated that, both in Birmingham and in other Midland and northern towns, future progress will be even more rapid than in the past. Last Saturday week a meeting of the members of the Windsor Street branch was held, at which Messrs. Granger and Stevens (members of the Town Council) addressed the men on the advantages of trade unionism, not only in maintaining their rights and reasonable requirements by their own influence, but also in spreading a spirit of willingness through their own ranks to render just and fair work to their employers, without which they could not anticipate success in their efforts to improve their own position.

The Blackburn Corporation Gas Accounts.—The annual financial statement of the Blackburn Corporation Gas Department just issued shows that on capital account £1329 was spent on a new mechanical stoker, £1267 on new mains, £980 on new meters, and £475 in purchasing some houses for extension purposes. On revenue account £28,820 was expended during the year on coal and cannel, as against £26,537 in the previous twelve months; £6751 in wages at the works, against £7104; £4933 in repairs and maintenance, against £3799; £1306 on repairs and renewals, &c., of service-pipes, against £1626; and £467 on gas-stoves, against £866—making a total of £52,935, against £49,300. The receipts embraced £56,044 for gas, as against £58,058 in the previous twelve months; £5995 for public lighting, against £6074; £2297 for gas-stoves and engines, against £2006; and £11,506 for residual products, against £10,350—making a total of £76,176, against £76,600. The profits amounted to £23,241.

Alexandria Water Company, Limited.—The Directors of this Company notify the payment of a final dividend of 5 per cent.; making with the interim distribution, 7½ per cent. for the year ended March 31 last.

The Accident at the Tredegar Gas-Works.—The damage resulting from the accident at the Tredegar Gas-Works, reported in the JOURNAL last week, has turned out to be less serious than was at first upposed. Mr. L. Marshall, the Engineer of the Tredegar Iron Company, immediately set to work to repair the injury done; so that by the night following the accident the fires were lit, and the men proceeded to make gas. The danger of the town being enveloped in darkness at night was therefore fortunately averted. Mr. Wells, the Gas Manager, was untiring in his efforts to remedy the matter, and the greatest possible assistance was rendered by Mr. Lloyd, retort setter, of Cardiff and Llanelly, who has commenced putting in the new retorts, which will be set on an improved principle, whereby the make of gas will be increased 50 per cent., at the same time effecting a saving of fuel and firing. We understand that it is intended to remove the presen siding, so as to obviate the possibility of a similar accident.

Embezzlement by a Clerk.—At the Mansion House Police Court on Monday last week, Howard Baylis, a clerk, was charged on a warrant with embezzlement to the amount of about £200. The prisoner has been for three or four years in the service, as bookkeeper and cashier, of Messrs. J. E. H. Andrew and Co., Limited, gas-engine manufacturers at Redditch, at their London offices in Queen Victoria Street. It was part of his duty to receive sums which customers might pay; but he should have accounted at once for all receipts to Mr. Hobson, the Manager, and have paid them into the banking account of the Company every Saturday. The Company gave up their London business a few months ago; and the result of applications to customers for their accounts led to the discovery of the prisoner's defalcations. The Company's Manager, when before the Court, recommended the prisoner to mercy, and only one charge—that of embezzling £12 10s.—was proceeded with, to enable the Magistrate to deal with the case summarily. Witnesses were called who gave the prisoner a good character, and circumstances of extenuation were communicated to the Court in a written statement which the prisoner handed up. He was sentenced to six weeks' imprisonment.

The Gasholder Accident at Lyttelton (N.Z.).—The three sailors whose folly was the cause of the gasholder accident at Lyttelton (N.Z.), reported in the JOURNAL last week, have been charged before the Resident Magistrate, with unlawfully and maliciously injuring the Gas Company's works and property, as well as the property of the owner of a garden through which the stone passed before it struck the holder, and liberated the gas. The whole damage was put at only £7; but by the Malicious Injuries Act, under which the charge was brought, the accused—one a man of thirty-three and the others youths of seventeen—are liable to terms of imprisonment ranging from two to ten years. The prisoners have been remanded. The stone which did the mischief was started at the top of a hill, and, gaining impetus as it rolled, crashed into the gasholder and fell inside. The liberated gas rushed through the purifier-house into the retort-house, where it was ignited by the furnaces—a terrific explosion being the result. At the time of the accident, there were 12,000 cubic feet of gas in the holder, the whole of which was lost. The works are insured in the Liverpool and London and Globe Company for £2000. The task of repairing the holder was commenced without delay by the Manager (Mr. Arnold), who resides near the works. Fortunately no one was upon the premises at the time of the occurrence.

The Southwark and Vauxhall Water Company and the Supply of Wimbledon.—The Wimbledon Local Board had before them at a recent meeting a letter from Dr. Page, who complained of the failure of the Southwark and Vauxhall Water Company to provide a proper supply of water to his residence. It was now, he said, some years since the Company undertook to give a constant supply; and if the Board would initiate proceedings to enforce the law, he would gladly assist them in any way in his power. The Road and Drainage Committee recommended that the Clerk should communicate with the Company, threatening them with proceedings to enforce the provision of a constant supply. Mr. Casswell, in moving the adoption of the recommendation, said the Committee were unanimously of opinion that the parish had waited long enough for the continuous supply which the Company promised some years ago, and for which they put the inhabitants to great expense at the time. Mr. Ansell seconded the motion. The Clerk called attention to the fact that it was necessary for the Local Government Board to give the Company notice of proceedings unless they complied with the law. The penalty, he said, was £200, with £100 a month continuing penalty. The motion was amended so as to include an instruction to the Clerk to write to the Local Government Board, and it was then carried.

The Proposed Extension of the Atherton Gas-Works.—At the Atherton Local Board offices last Tuesday, Colonel C. H. Luard, R.E., one of the Inspectors of the Local Government Board, held an inquiry into an application of the Atherton Board for sanction to borrow £4500 for gas-works extensions. Mr. Thomas Newbigging, C.E., Consulting Engineer to the Board, was present. The Clerk (Mr. D. Scofield) said that, when the Board purchased the gas-works in 1873 for £11,200, they required very considerable improvement to adapt them to the development of the town. A loan of £20,000 which was raised had been exceeded; the sum being insufficient to provide for the necessary increase. In 1872 the sale of gas was 8 million cubic feet; and in 1889 it was 26 million feet. As the outlay at present amounted to £27,456, the gas capital stood considerably less now, in proportion to the work done, than it did at the time of the purchase of the undertaking. The price of gas was 3s. 6d. per 1000 cubic feet, with a reduction of 3d. for prompt payment; and in the case of large consumers a reduction of 15 per cent. was made. A profit had been realized every year, and it was utilized in making extensions of the mains; but they would be able to meet the proposed loan by the increased consumption of gas. He did not think the extensions would necessitate the raising of the price of gas materially; and the works required would be completed next year. Mr. Newbigging said he did not think the cost of production would be increased; but the proportion which capital bore to the revenue would be heavier, and perhaps one would compensate for the other. The Inspector having examined the plans, the inquiry closed.

The Middleton Corporation Gas Undertaking.—At the meeting of the Middleton Town Council yesterday week, Mr. G. Booth made a statement with regard to the position of the gas undertaking. In the course of his remarks he said that the amount of coke made during the year ending in March last was 4677 tons, as against 4477 tons in 1888-9, whereas the amount of fuel carbonized was 7196 tons this year, as against 6888 tons in the previous year. The coke used for fuel on the works in 1888-9, was 2817 tons, and in 1889-90 only 2657 tons. According to the monthly returns, the coke used in the latter period was 2975 tons 15 cwt.; but according to the annual statement it was only 2657 tons, or a deficiency of 318 tons. Then the quantity of tar made in 1890 was 437 tons from 7196 tons of fuel carbonized, while in 1889 the tar made was 460 tons from only 6888 tons of fuel carbonized, or with 308 tons more fuel carbonized they had 23 tons less tar. The quantity of liquor made in 1890 was only 664 tons, against 755 tons in 1889—showing a decrease of 91 tons; and yet the coal and cannel carbonized in 1890 was 308 tons more. The cost of purifying materials in 1890 showed an increase of £65 over 1889; while they had only carbonized 310 tons more fuel. This gave 4s. 2d. per ton for carbonizing the extra fuel. The capital of the gas undertaking had increased, and now stood at £100,962, or £14 0s. 7d. per ton of fuel carbonized. In Manchester it was only £4 12s. per ton; at Oldham, £5 2s. per ton; and at Stockport, £3 17s. per ton. He was afraid there would be a scarcity of good and cheap gas at Middleton so long as they had such a large capital on the gas-works. He much regretted that since the last meeting they had lost their Gas Manager. Several members severely criticized Mr. Booth's remarks; and Mr. Lord, in reply, said they did not always get the same quantity of tar and coke from the same bulk of coal and cannel. The alteration from twelve-hour to eight-hour shifts had tended to decrease the production of tar. The profit in the Gas Department last year was £1183; this year it was £501. There were many ways of accounting for this difference. The minutes were passed.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 1118.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Apr.	10½	Alliance & Dublin 10 p. c.	10	17—18	..	5 16 8
100,000	10	,,	7½	Do. 7 p. c.	10	11½—12½	..	6 0 0
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	109—111	..	4 10 1
100,000	20	30 May	8	Bahia, Limited	20	19⅜—20½	..	7 16 1
200,000	5	15 May	7½	Bombay, Limited	5	7⅞—7⅞	+⅛	4 16 8
40,000	5	,,	7½	Do. New	4	4¼—5¼	..	5 17 10
380,000	Stck.	27 Feb.	12½	Brentford Consolidated	100	218—223	..	5 9 10
125,000	,,	,,	9½	Do. New	100	160—165	..	5 12 2
220,000	20	13 Mar.	11	Brighton & Hove Original	20	40—42	..	5 4 9
320,000	20	28 Mar.	11½	British	20	43—45	..	5 0 0
50,000	10	13 Mar.	11	Bromley, Ordinary 10 p. c.	10	18—20	..	5 10 0
39,000	10	,,	8	Do. 7 p. c.	10	13—14	..	5 14 3
328,750	10	13 June	8	Buenos Ayres (New) Limited	10	13½—14½*	..	5 10 6
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	105—108	..	5 11 1
150,000	20	27 Feb.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Apr.	13⅜	Commercial, Old Stock	100	249—254	..	5 8 3
130,000	,,	,,	10½	Do. New do.	100	200—205	..	5 4 10
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	118—123	..	3 13 3
557,320	20	13 June	13	Continental Union, Limited	20	47—49*	..	5 6 2
242,680	20	,,	13	Do. New '69 & '72	14	33—35*	+½	5 4 0
200,000	20	,,	10	Do. 7 p. c. Pref.	20	37—39*	..	5 2 6
75,000	Stck.	28 Mar.	10	Crystal Palace District	100	195—205	..	4 17 7
234,060	10	30 Jan.	13	European, Limited	10	27—28	..	4 12 10
120,000	10	,,	13	Do. New	5	18½—19½	..	5 0 0
354,060	10	,,	13	Do. do.	5	13—14	..	4 12 10
5,470,620	Stck.	13 Feb.	13⅜	Gaslight & Coke, A, Ordinary	100	245—250	..	5 10 0
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—103	..	3 17 8
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	253—258	..	3 17 6
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	121—125	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	180—185	..	4 1 1
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	162—166	..	4 4 6
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	253—258	..	3 17 6
1,061,150	,,	13 June	4	Do. 4 p. c. Deb. Stk.	100	115—120*	..	3 6 8
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	123—128*	..	3 10 4
650,000	,,	,,	6	Do. 6 p. c. do.	100	163—168*	..	3 11 5
3,800,000	Stck.	15 May	12	Imperial Continental	100	217—222	+2½	5 8 1
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd.	5	5—5⅛	..	5 9 1
560,000	100	1 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	112—114	..	4 7 9
541,920	20	13 June	6⅔	Monte Video, Limited	20	20⅜—21⅜*	..	6 0 11
150,000	5	30 May	10	Oriental, Limited	5	8⅜—9	..	5 11 1
60,000	5	28 Mar.	7	Ottoman, Limited	5	5⅜—6	..	5 16 8
166,870	10	26 July	4	Pará Limited	10	3½—4½	..	8 17 9
420,000	100	2 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	98—102	..	5 17 8
500,000	100	2 Dec.	6	2nd Do.	100	95—100	..	6 0 0
150,000	10	16 Apr.	10	San Paulo, Limited	10	14⅜—15⅛	..	6 9 0
500,000	Stck.	27 Feb.	13½	South Metropolitan, A Stock	100	285—295	..	4 9 10
1,350,000	,,	,,	11½	Do. B do.	100	230—235	..	4 17 10
141,500	,,	,,	12	Do. C do.	100	245—250	..	4 16 0
650,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	140—145	..	3 9 0
60,000	5	27 Feb.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
728,446	Stck.	13 June	9½	Chelsea, Ordinary	100	260—265*	+2½	3 11 8
1,720,560	Stck.	16 Apr.	7½	East London, Ordinary	100	216—220	..	3 8 0
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	144—149	..	3 0 5
700,000	50	13 June	9	Grand Junction	50	122—126*	..	3 11 5
708,000	Stck.	13 Feb.	10½	Kent	100	275—280	..	3 15 0
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	255—260	..	3 13 0
406,200	100	,,	7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
200,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	122—126	..	3 3 6
500,000	100	13 Feb.	12½	New River, New Shares	100	367—372	..	3 5 2
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk	100	127—130	..	3 1 6
902,300	Stck.	13 June	6	S'thwk & V'xhall, 10 p. c. max.	100	168—172*	+1	3 9 9
126,500	100	,,	6	Do. 7½ p. c. do.	100	158—163*	..	3 13 7
1,155,066	Stck	13 June	10	West Middlesex	100	258—263	+1*	3 16 1

*Ex.div.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO.,

TELEPHONE No. 2698.

HYDRAULIC AND GAS ENGINEERS, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

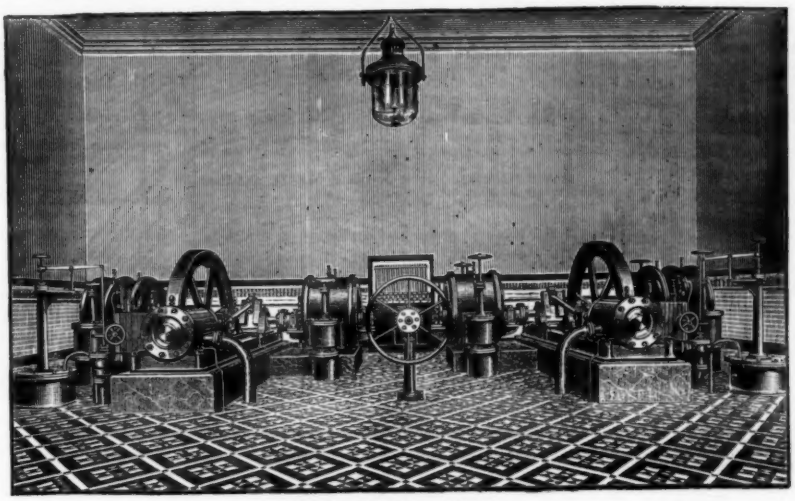
Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co. for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 28,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.

Catalogues and Testimonials on application at the above address.



Only 75 Revolutions per Minute.

The above Engraving shows Two Engines driving Four GWYNNE & CO.'S PATENT NON-FLUCTUATING EXHAUSTERS to pass 200,000 cubic feet per hour (without the slightest oscillation), at the EFFINGHAM STREET GAS-WORKS, SHEFFIELD.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAYS.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEAR DALKEITH, }

GAS Authorities requiring Second-hand GAS APPARATUS—Mouthpieces, Hydraulic Mains, Condensers, Purifiers, Exhausters, Station Meters, &c. Also superior quality Gas-Purifying BOG ORE (OXIDE OF IRON). Please address, D. M. NELSON AND SONS, 164, St. Vincent Street, GLASGOW. (Telegraphic Address: "GAS GLASGOW.")

EXTRACT from the Harrogate Gas Company's Report, dated the 5th of February, 1890: Coal consumed, 8600 tons. Gas made, 92,880,000 feet; ditto sold, 84,880,000 feet; ditto unaccounted for, 8,000,000 feet; quantity made per ton, 10,800 feet; ditto sold, 9869 feet. Illuminating Power, 16·1 candles. Coals used, Brancepeth. Owners, Strakers and Love, Newcastle-on-Tyne; who have also Brandon Hutton Seam Unscreened Gas Coal. Analysis, 10,500 cubic feet per ton; Illuminating Power, 16·2 candles.

TAR and Liquor wanted.
BROTHERTON AND CO., Commercial Buildings, LEEDS.

WANTED, a Re-engagement as WORKING MANAGER or FOREMAN, practically experienced in Carbonizing, Engines and Exhausters, Fitting, Main and Service Laying, Index Reading, and the General Routine of Gas-Works. Unexceptionable references. Total abstainer.
Address No. 1629, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Four Retort Setters. Six months' work to competent Men.
Apply to J. W. LLOYD, 14, Neville Place, Riverside, Cardiff, SOUTH WALES.

JOURNEYMEN Gas-Fitters, of good character, desiring employment in the Autumn should REGISTER their NAMES. For capable men, good wages and good openings.
Address the FITTINGS SUPERINTENDENT, Corporation Gas Department, BIRMINGHAM.

WANTED, from Sept. 1 to March 31, the hire of eight or ten TRAVELLING TANKS or conveying Tar and Liquor.
Apply by letter, giving prices and full particulars, to No. 1626, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 1060 of last week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.
Telegraphic Address: "Braddock, Oldham."

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

FOR SALE—Fourteen Circular Wrought- Iron RETORT-LIDS (15-inch). Some quite new.
Apply to the SECRETARY, Gas Company, Knighton, RADNORSHIRE.

FOR SALE—A Kirkham, Hulett, and Chandler's WASHER-SCRUBBER, of a capacity of 300,000 cubic feet per day; also a 12-inch GOVERNOR by Peebles.
Can be seen at work on application to F. C. HUMPHRYS, Gas-Works, ILKESTON.

FOR SALE—One 8-horse power Engine and COAL BREAKER, with top and bottom Elevator, Gear, and Patent Wrought-Iron Chain, with Malleable Iron Buckets complete.
The above Machinery is almost new, having only been in use about Three months.
For further particulars, apply to the COAL DISTILLATION COMPANY—COOPER'S PATENTS—LIMITED, 322 and 323, Winchester House, Old Broad Street, LONDON E.C.

THE St. Andrews Gas Company have FOR SALE a GAS CONDENSER, taken down to be replaced by a larger one—Two Cast-Iron Boxes in four lengths each, with four Faucets for 9-inch Pipes in each length, or 32 Pipes in all, with double connecting Breek Pipes at top. The whole is in good condition. Suitable for Works making under 20 million cubic feet. Will be sold cheap.
J. HALL, Manager.
Gas-Works, St. Andrew's, April 12, 1890.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 1144.
Inquiries should be addressed to THE COZE SYNDICATE, LIMITED, 86-88A, LEADENHALL STREET, E.C.

BENTLEY & CO.

MANCHESTER ELECTRICAL STORES.

FOR Batteries, Bells, Wires, and Special Electrical Apparatus, address the best house
17, NEWTON STREET, PICCADILLY, MANCHESTER.

FOR SALE—About 8½ tons of Spigot and Socket 4-inch Cast-Iron GAS-MAINS.
Apply to the BROSELEY GAS AND COKE COMPANY LIMITED, Broseley, SALOP.

FOR SALE—One Single Gasholder, 80 feet diameter by 20 feet deep, ten Cast-Iron Columns and Wrought-Iron Girders.
Also four PURIFIERS in a group, 16 ft. by 12 ft. by 3 ft. 9 in. deep; 12-inch Centre-Valve and Connections.
Would erect the above, and make practically equal to new.
Inquiries invited for various second-hand Gas Plant—Gasholders, Tanks, Purifiers, Washers, Exhausters, Station Meters, &c.
Apply to SAML. WHILE (late Ashmore and While), 60, Queen Victoria Street, LONDON, E.C.

BY ORDER OF THE EXECUTORS (RE BATTLEY DECEASED) AND OTHERS.

GAS AND WATER SHARES.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, Tokenhouse Yard, E.C., on Tuesday, June 24, 1890, at Twelve o'clock for One o'clock, in Lots, SHARES and STOCK in the following Companies:—
Commercial Gas Company.
Tottenham and Edmonton Gas Company.
Harrow Gas Company.
North Camp and Farnboro' Gas Company.
South-West Suburban Water Company.
London and County Land and Building Company.
Particulars of the AUCTIONEER, 8, NEW BROAD STREET, E.C.

FOR SALE—Seven Purifiers, 15 feet square, with Sieves, Connections, Valves, and Lifting Apparatus complete.
One PURIFIER, 20 ft. by 16 ft., with Sieves, Connections, Valves, and Lifting Apparatus complete.
One SCRUBBER, 20 ft. by 6 ft. diameter.
(The above may now be seen at work.)
Two Wrought-Iron TANKS, 8 feet diameter by 7 feet and 6 feet respectively.
One REID'S GAS WASHER.
Two Cast-Iron TANKS, 15 ft. 8 in. diameter by 11 ft. 4 in. and 8 ft. 6 in. respectively.
Two EXHAUSTERS (Jones), equal to 25,000 cubic feet per hour.
A number of 15-inch and other VALVES.
A quantity of SHAFTING and PULLEYS.
J. HEPWORTH.
Gas-Works, Carlisle, April 28, 1890.

DALTON-IN-FURNESS DISTRICT LOCAL BOARD.

GASHOLDER FOR SALE.

THE Board invite Tenders for the purchase of the GASHOLDER and TANK at present erected near Askam.
Information relating thereto may be obtained on application at the Surveyor's Office, Dalton-in-Furness.
Sealed tenders, addressed to the Chairman of the Highways and Lighting Committee, and endorsed "Gasholder," must be delivered at the Clerk's Office not later than Saturday, the 21st inst., at Twelve o'clock at noon.
The Board do not pledge themselves to accept the lowest or any tender.
By order,
JOHN TYSON, Clerk to the Board.
Clerk's Office, Dalton-in-Furness, June 6, 1890.

TENDERS FOR TAR.

THE Hinckley Local Board invite Tenders for the surplus TAR produced at their Gas-Works during the next One, Two, or Three years.
The annual quantity will be about 200 tons.
Sealed and endorsed tenders to be sent on or before June 30 to the undersigned.
E. H. MILLARD, Gas Manager.

TENDERS FOR COAL AND CANNEL, LIME, AND SURPLUS COKE.

THE Hinckley Local Board invite Tenders for the supply of GAS COAL and CANNEL for One or Two years, as may be determined on, at the rate of 2800 tons and 100 tons per annum respectively; and for 100 tons of best h. p. hard burnt LIME, delivered at Hinckley Station. Also for 500 tons of surplus COKE, to be taken as made or required by the Manager, delivered into Trucks at Hinckley Station.
Conditions and forms of tender may be obtained on application.
Sealed and endorsed tenders to be sent on or before June 30 to the undersigned.
E. H. MILLARD, Gas Manager.

THE Chorley Corporation are prepared to receive TENDERS for the supply of about 120 tons of OXIDE OF IRON for purifying purposes at their Gas-Works.
Tenders, endorsed "Oxide," accompanied by sample, to be sent to me before Twelve o'clock noon, on Wednesday, the 18th of June inst.
The Corporation do not bind themselves to accept the lowest or any tender.
THOS. A. JACKSON, Town Clerk.
Chorley, June 6, 1890.

THE Chorley Corporation invite Tenders for the purchase of the surplus TAR produced at their Gas-Works for One year, commencing the 1st of July next, delivered in Contractor's Tanks at the Chorley Railway Station.
Approximate quantity, 450 tons.
Tenders, endorsed "Tender for Tar," to be sent to me before Twelve o'clock noon, on Wednesday, the 18th of June inst.
The Corporation do not bind themselves to accept the highest or any tender.
THOS. A. JACKSON, Town Clerk.
Chorley, June 3, 1890.

THE Chorley Corporation are prepared to receive TENDERS for the supply of all the GAS COAL required at their Gas-Works, for a period of One year, from the 1st of September next.
Forms of tender and any further information may be obtained on application to Mr. Wm. Blackledge, Gas Manager
Tenders, endorsed "Tender for Coal," to be sent to me before Twelve o'clock noon, on Wednesday, the 18th of June inst.
The Corporation do not bind themselves to accept the lowest or any tender.
THOS. A. JACKSON, Town Clerk.
Chorley, June 3, 1890.

TO COLLIERY PROPRIETORS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for 120,000 tons of Screened GAS COAL, and 23,000 tons of CANNEL (not Scotch), to be delivered between Aug. 1, 1890, and June 30, 1891, as follows:—105,000 tons to be delivered at the Company's Siding at Neepsend, on the M. S. & L. Railway; and 38,000 tons to be delivered by Carts at the Effingham Street or Neepsend Works in such monthly quantities as may be required.
Tenders to state the maximum quantity the Contractors can supply.
The Directors reserve the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any tender.
Conditions and forms of tender may be obtained on application to the undersigned.
Tenders, marked "Tender for Coal," must be delivered at the Company's Offices not later than Thursday, June 19, 1890.
HANBURY THOMAS, General Manager,
Gas Company's Offices, Commercial Street,
Sheffield June 5, 1890.

TO IRONFOUNDERS AND OTHERS.

THE Widnes Local Board are prepared to receive TENDERS for the supply of Two, 20 feet square, PURIFIERS and COVERS.
Full particulars may be obtained upon application to Mr. Carr, Gas Works, Widnes.
Tenders, endorsed "Purifiers," to be delivered to the undersigned not later than the 28th inst.
The Board do not bind themselves to accept the lowest or any tender.
JAS. T. ALLEN, Clerk.
Town Hall, Widnes, June 11, 1890.

CITY OF CARLISLE.

TAR CONTRACT.

THE Carlisle Gas Committee are prepared to receive TENDERS for the surplus TAR to be produced at their Works, for a period of One or more years from the 30th of June next.
Any further particulars required can be obtained upon application to the Engineer, to whom sealed tenders, endorsed "Tender for Tar," must be delivered on or before June 28, 1890.
The Committee do not bind themselves to accept the highest or any tender.
J. HEPWORTH,
Engineer and Manager.
Gas-Works, Carlisle, June 10, 1890.

CITY OF CARLISLE.

TENDERS FOR COAL AND CANNEL.

THE Carlisle Gas Committee are prepared to receive TENDERS for the supply of about 14,000 tons of Screened or Unscreened GAS COAL and about 3000 tons of CANNEL, to be delivered at their Works in Carlisle in such quantities as may be directed, from July, 1890, to June, 1891.
Tenders, specifying the description of the Coal or Cannel, the pits at which they are raised, and the terms for net monthly payment, are to be sent on or before June 28, 1890, endorsed "Tender for Coal."
J. HEPWORTH,
Engineer and Manager.
Gas-Works, Carlisle, June 10, 1890.

COUNTY BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Halifax Corporation are prepared to receive TENDERS (from Colliery Proprietors only) for the supply of 46,000 tons of GAS COAL, and 10,000 tons of CANNEL COAL, to be supplied in such quantities as may from time to time be determined by the Gas-Works Committee during the year ending the 30th of June, 1891.
Forms of tender and further information may be obtained on application to Mr. Thomas Holgate, Manager, Gas-Works, Halifax.
Tenders, endorsed 'Tender for Coal," must be sent to me on or before Ten o'clock on the 27th of June, 1890.
The lowest or any tender not necessarily accepted.
By order,
KEIGHLEY WALTON, Town Clerk.
Town Hall, Halifax, June 13, 1890.

TO COLLIERY PROPRIETORS.

THE Gas Committee of the Stafford Corporation are prepared to receive TENDERS for the supply of 10,000 tons of COAL for Gas-Making Purposes.
The Coal to be delivered during the Twelve months ending July 31, 1891, in about equal monthly quantities.
Forms of tender, and any further information required, may be obtained on application to Mr. J. F. Bell, Gas Engineer, Stafford.
Tenders, sealed, and endorsed "Tender for Gas Coal," to be sent to me on or before Saturday, the 28th inst.
The Committee do not bind themselves to accept the lowest or any tender.
By order,
MATT. F. BLAKISTON, Town Clerk.
Stafford, June 13, 1890.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shrewsbury Gaslight Company invite TENDERS for the supply of about 10,500 tons of Screened GAS COAL, to be delivered free at the Great Western or London and North-Western Goods Yard, Shrewsbury, during the year commencing July 1, 1890, and ending June 30, 1891.
The Directors reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any tender.
Tenders must be made on forms (containing further particulars) which may be obtained on application at the Company's Works, or by post, and must be sent to the undersigned on or before the 20th day of June, 1890.
By order,
WM. BELTON, Assoc. M. Inst. C.E.,
Secretary and Manager.
Gas-Works, Shrewsbury, May 29, 1890.

SHREWSBURY GASLIGHT COMPANY.

DISPOSAL OF SURPLUS TAR.

THE Directors of the above Company are desirous of receiving TENDERS for the purchase of the surplus TAR made at their Works during the year commencing July 1, 1890.
The estimated quantity for disposal is about 800 tons per annum.
Tenders must be made on forms (containing further particulars) which may be obtained on application at the Company's Works, or by post, and must be sent in to the undersigned not later than the 20th day of June, 1890.
The Directors do not bind themselves to accept the highest or any tender.
By order,
WM. BELTON, Assoc. M. Inst. C.E.,
Secretary and Manager.
Gas-Works, Shrewsbury, May 29, 1890.

THE Local Board for the District of Bishop's Stortford are prepared to receive TENDERS for LIGHTING the PUBLIC STREETS at present lighted of the District of Bishop's Stortford for One year, from the 16th day of August next.
Tenders are to be delivered to me, the undersigned, not later than Thursday, the 17th day of July next.
By order of the Board,
W. P. SLATER, Clerk.
North Street, Bishop's Stortford,
June 13, 1890.

CANNEL AND COAL.

THE Directors of the Hyde Gas Company require TENDERS for the supply of CANNEL and COAL on or before Wednesday, the 25th of June, 1890.
Specifications and forms of tender may be obtained from the undersigned.
WILLIAM SMITH,
Secretary and Manager.
Gas Offices, Raglan Street, Hyde,
June 6, 1890.

TAR AND LIQUOR AND SPENT OXIDE.

THE Directors of the Hyde Gas Company are prepared to receive TENDERS for the purchase of the surplus TAR and LIQUOR made at their Works for One year from the 1st of July next. Also TENDERS for about 130 tons of SPENT OXIDE.
Tenders, sealed and endorsed "Tender for Tar and Liquor," or "Spent Oxide," addressed to the Chairman, must be sent on Wednesday, the 25th of June, 1890, to the undersigned, from whom all particulars may be obtained.
The Directors do not bind themselves to accept the highest or any tender.
WILLIAM SMITH,
Secretary and Manager.
Gas Offices, Raglan Street, Hyde,
June 6, 1890.

HARTLEPOOL GAS AND WATER COMPANY.

THE Directors of the Hartlepool Gas and Water Company are prepared to receive TENDERS for the supply and erection at their Works, West Hartlepool, of a WASHER, or WASHER-SCRUBBER, capable of dealing with 1½ million cubic feet of Gas per diem.
Plans, showing proposed position of the Washer, together with any further information, may be obtained on application to the Company's Engineer, Mr. Thomas Bower.
Tenders, sealed, and endorsed "Tender for Washer," to be sent to the undersigned not later than Tuesday, the 8th day of July next.
The Directors do not bind themselves to accept the lowest or any tender.
THOMAS TREWHITT, Secretary.
Gas-Works, West Hartlepool, June 16, 1890.

BETHESDA.

THE Bethesda Improvement Commissioners invite TENDERS for the supply of GAS COAL for a period of One year, commencing from the 1st day of August, 1890, to the 31st day of July, 1891, to be delivered at the Bethesda Railway Station in such quantity and at such times as may be required.
The Coal must be of the best of its kind, well screened, and free from Bats, Pyrites, or other Impurities.
Parties tendering must give full information as to the Coal offered, and the Colliery from which they propose to supply; and the tenders to be sent to me not later than the 25th day of June, 1890.
The Commissioners do not bind themselves to accept the lowest or any tender.
R. BENJAMIN EVANS,
Clerk to the Commissioners.
Rachub, near Bangor, June 9, 1890.

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

TAR CONTRACT.

THE Directors of the above Company are prepared to receive TENDERS for the surplus TAR produced at their Works at Wandsworth during the Twelve months next, from the 1st of July, 1890.
The Contractor is to remove the Tar by barges whenever required by the Company's Engineer.
Payments to be made by cash monthly.
Tenders, endorsed "Tender for Tar," to be sent in on or before June 21 inst.
The Directors do not bind themselves to accept the highest or any tender.
By order,
W. CROMARTY, Secretary.
98, North Street, Wandsworth,
June 12, 1890.

LEEK IMPROVEMENT ACT, 1855.

TO TAR DISTILLERS AND OTHERS.

THE Leek Improvement Commissioners invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR produced at their Gas-Works for One, Two, or Three years, from the 1st of July, 1890, at per ton of 2240 lbs. at such Works.
Particulars may be obtained from Mr. Norfolk, Manager, or the undersigned.
Endorsed tenders, addressed to the Chairman of the Gas Committee, Town Hall, Leek, to be delivered by Four o'clock in the afternoon of Monday, the 23rd of June, 1890.
The Commissioners reserve to themselves the option of selling the Tar without the Ammoniacal Liquor.
The highest or any tender will not necessarily be accepted.
C. HENSHAW, Clerk.
Town Hall, Leek, June 7, 1890.

BURY CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee of the Bury Corporation are prepared to receive TENDERS for the purchase of 200 tons (more or less) of SPENT OXIDE.

Tenders, endorsed "Tender for Spent Oxide," to be in the hands of J. Haslam, Esq., Town Clerk, Bury, not later than Noon on Tuesday, the 24th inst.

Forms of tender and further particulars may be obtained from the undersigned.

W. H. S. GENDALL, Manager.

Gas Office, Elton, Bury,
June 13, 1890.

TENDERS FOR COAL AND CANNEL.

THE Gas Committee of the Penrith Local Board are prepared to receive TENDERS for the supply of about 2500 tons of GAS COAL and 500 tons of CANNEL during the year ending June 30, 1891.

Tenders, endorsed "Tender for Coal," to be delivered to Mr. G. Wainwright, Public Offices, Penrith, not later than Monday, the 30th of June, 1890.

Further particulars may be obtained from

EDWARD SHAUL, Manager.

Gas-Works, Penrith,
June 13, 1890.

TENDERS FOR COAL.

THE Corporation of Batley are prepared to receive TENDERS for the supply and delivery at their Gas-Works of 14,000 tons of GAS COAL.

Conditions and form of tender may be obtained on application to the Manager at the Gas-Works.

Sealed tenders, addressed to me, and endorsed "Gas Coal," to be delivered at my Office on or before Saturday, the 21st of June inst.

The Corporation do not bind themselves to accept the lowest or any tender, and may accept any tender for a part only of the specified quantity.

J. H. CRAIK, Town Clerk.

Town Clerk's Office, Batley, June 10, 1890.

TENDERS FOR COALS.

THE Directors of the Westerham Gas and Coke Company, Limited, invite TENDERS for a Year's supply of about 450 tons of the best screened GAS COAL, delivered to Westerham Station, in quantities to suit the convenience of the Directors.

Tenders, stating the description, and endorsed "Tender for Coal," to be sent to the Office of the Company on or before Wednesday, the 2nd of July.

The Directors do not bind themselves to accept the lowest or any tender.

By order,

CHAS. HOOKER,
Secretary and Manager.

Westerham, Kent.

TO OXIDE OF IRON MERCHANTS.

THE Corporation of Birkenhead are prepared to receive TENDERS for the supply of 200 tons of OXIDE OF IRON.

Forms of tender and any other information may be obtained from Mr. T. O. Paterson, Gas Engineer, Gas-Works, Thomas Street.

Tenders, sealed and endorsed "Tender for Oxide of Iron," to be sent in to me not later than Five o'clock in the Afternoon of Friday, the 20th of June, 1890.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,

ALFRED GILL, Town Clerk.

Town Hall, Birkenhead,
June 2, 1890.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

TAR.

THE Gas Committee invite Tenders for the purchase and removal of the surplus TAR to be produced at their Bloom Street, Regent Road, and Liverpool Street Works in Twelve months from July 13 next.

The approximate quantity will be 4500 tons.

Forms of tender and conditions of contract may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed tenders, endorsed "Tender for Tar," addressed to the Chairman of the Gas Committee, must be delivered to me on or before Thursday, the 10th prox., at Five o'clock in the evening.

By order,

SAML. BROWN, Town Clerk.

Town Hall, Salford, June 12, 1890.

BOROUGH OF BURTON-UPON-TRENT.

RESIDUAL PRODUCTS.

THE Gas Committee of the Burton-upon-Trent Corporation invite TENDERS for the purchase of the AMMONIACAL LIQUOR and surplus TAR to be produced at their Works during Twelve months, from the end of July next.

Probable quantity of Coal carbonized during the Twelve months, 21,000 tons.

The Liquor and Tar will be delivered free into Contractor's Tank-Trucks on the Gas-Works Railway Siding.

The Strength of the Liquor will be tested by Twaddel's Hydrometer; and persons tendering are requested to state the price per ton to be paid for each ½° of strength from 3½° to 8°.

Payments, net cash monthly.

Separate tenders for Liquor and Tar, sealed, and endorsed "Tender for Residual Products," are to be delivered to me at or before Ten a.m., on Saturday, the 28th of June inst.

The highest or any tender will not necessarily be accepted.

F. L. RAMSDEN,
Manager and Engineer.

Gas-Works, Burton-upon-Trent,
June 9, 1890.

BOROUGH OF WORKINGTON.

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Corporation of Workington are prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Gas-Works during the year ending June 30, 1891.

The quantity of Coal carbonized is 6000 tons per annum.

Tenders, sealed, and endorsed "Tender for Tar," or "Ammoniacal Liquor," to be forwarded to the undersigned not later than the 24th inst.

(Signed) JOHN WARWICK,
Town Clerk.

Town Hall, June 3, 1890.

THE Directors of the Swindon Gas and Coke Company, Limited, are prepared to receive TENDERS for the supply of 500 to 1500 tons of best screened GAS COAL, delivered free at Swindon, G.W. Railway Station, or at the Swindon Town Station of the M. & S.W.J. Railway Company, in such quantities as required for the period of One year, commencing in the month of July next.

Tenders, endorsed, and addressed to the undersigned, to be sent in not later than Saturday, June 21.

The Directors do not bind themselves to accept the lowest or any tender.

No forms of tender provided.

By order,

H. C. SHEPHERD,
Manager and Secretary.

Gas Offices, Cricklade Road, Swindon.

CONTRACT FOR GAS COAL.

NOTICE is hereby given that the Local Board for the District of the Town of Horncastle, in the County of Lincoln, are prepared to receive TENDERS for the supply of from 500 to 1900 tons of Best Screened Silkstone GAS NUTS, to be delivered by the 10th of June, 1891, in such quantities and at such times as the Board may direct.

The Coal to be sent in a dry condition, free from Hards, Smudge, Dirt, Shale, Pyrites, or other Impurities.

Sealed tenders, marked "Tender for Gas Coal," to be sent to the Chairman of the Board, Mr. John Panton, St. Lawrence Street, Horncastle, on or before the 23rd day of June, 1890.

The Board do not bind themselves to accept the lowest or any tender.

By order,

CHARLES DEE, Clerk to the Board.

Horncastle, June 12, 1890.

COUNTY BOROUGH OF STOCKPORT.

SEWAGE OUTFALL SCHEME.

THIS Corporation intend to Construct SEWAGE OUTFALL WORKS and intercepting SEWER or SEWERS for the Borough and adjacent parts, and desire Engineers who may be willing either to submit a Scheme or to be interviewed with a view of the Corporation either inviting competition for some Scheme, or selecting some Engineer to devise a Scheme adapted for the requirements of the Borough, to communicate Names and Addresses, with nature of experience in similar Works, to the TOWN CLERK, STOCKPORT.

June 12, 1890.

TO INVENTORS AND PATENTEES.

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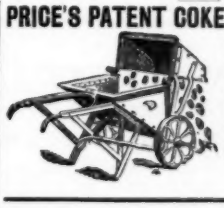

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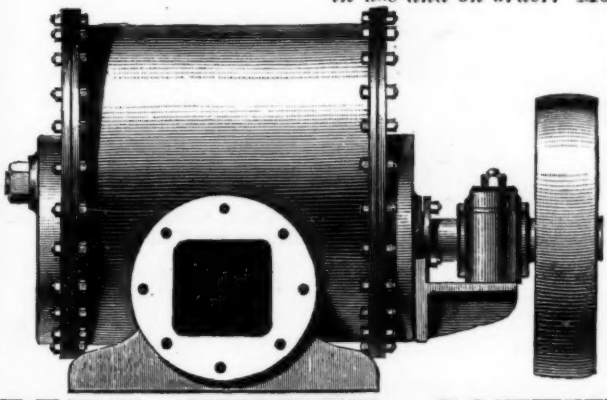
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5. No **heavy Fly-Wheel** needed; and **one-third less** power required.
6. The **only system** by which Exhausters **can be altered** to pass from **30 to 40 per cent.** more with same Driving Gear and Connections.

Oldest Makers of BEALE'S EXHAUSTERS for 300 Works.

SPECIALITY—Elevating and Conveying Machinery for Coal, Coke, Oxide, Lime, &c.

PARK STREET, SOUTHWARK, LONDON, S.E.,
AND AT STROUD, GLOUCESTERSHIRE.

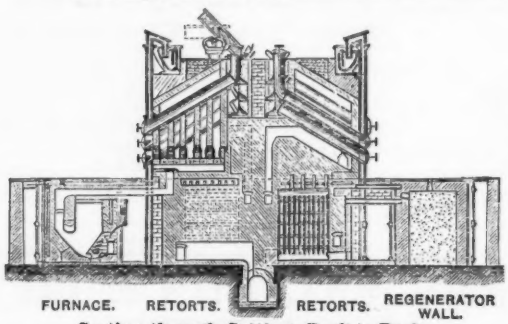
THE WIGAN COAL & IRON CO., LIMTD.,
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
MIDLAND DISTRICT OFFICE: 22, TEMPLE STREET, BIRMINGHAM—AGENT: A. C. SCRIVENER.
TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

G. J. EVESON,
GAS COAL AND CANNEL CONTRACTOR.
PATENTEE OF
A SPECIAL COMPOUND
FOR THE CURE OF STOPPED ASCENSION-PIPES,
A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power
PRICE AND PARTICULARS ON APPLICATION.
Head Office: CORPORATION STREET, BIRMINGHAM.

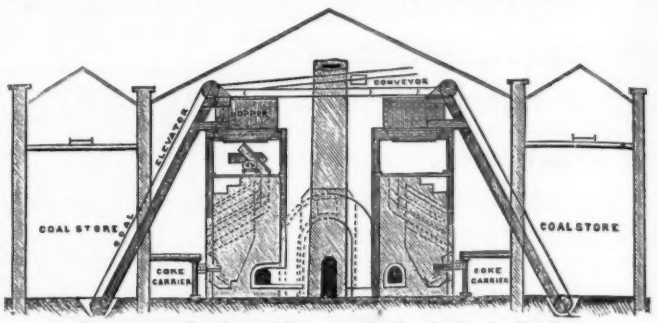
AUTOMATIC SYSTEM OF
CHARGING & DRAWING INCLINED GAS-RETORTS.

Gold Medal, Paris Exhibition, 1889.

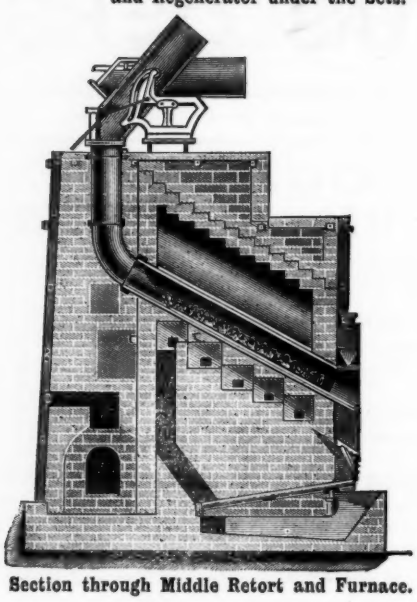
This System of Automatically Charging and Discharging Retorts without machinery or arduous labour is in operation at several places on the Continent and in America, and will shortly be at work in various Gas-Works in England.



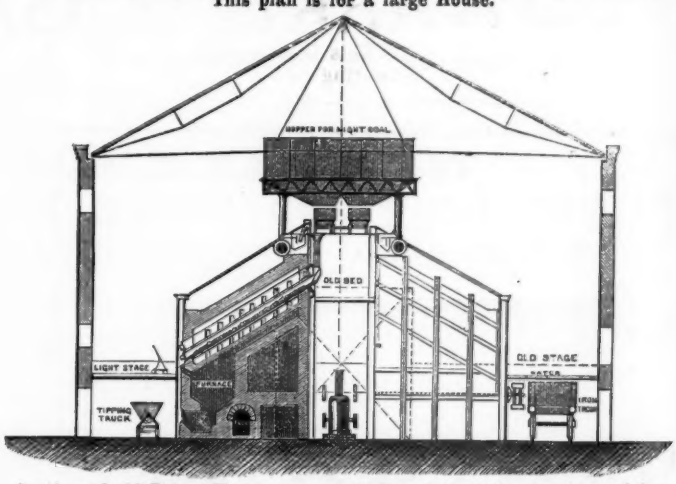
Section through Settings Back to Back.
Working off ground floor with Generator under Stage and Regenerator under the Sets.



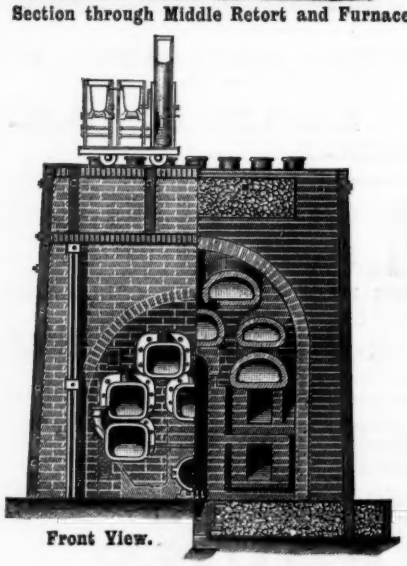
Transverse Section of House with Coze's Single Settings,
Showing Method of working Two Single Settings and Distributing the Coal to the Supply Hoppers; the whole of the work being Automatic.
This plan is for a large House.



Section through Middle Retort and Furnace.

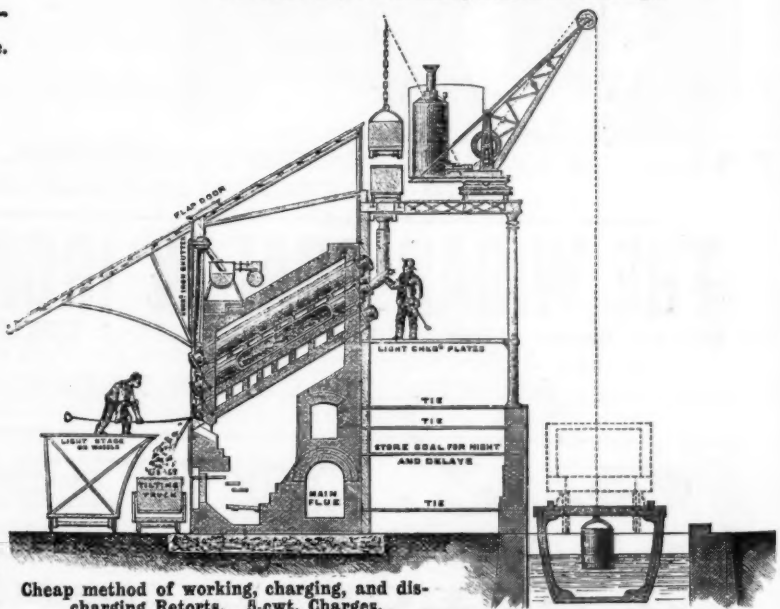


Section of old Retort-House converted, Two Sets 20 fts. in place of One.
Modified form, with ordinary Retorts and Fittings.



Front View.

Section through Furnace & Bed.



Cheap method of working, charging, and discharging Retorts. 5-cwt. Charges.
Section through Setting, Front to Back. Coal Barge or Railway.
Light Corrugated Roof over Sets and at Sides.

These Systems are fully Patented, and any Infringer will be strictly proceeded against.

For further particulars apply to W. M. KIGHT, Secretary of THE COZE SYNDICATE, LIMITED, 88A, LEADENHALL STREET, LONDON, E.C.

WATER GAS FUEL GAS

FOR INDUSTRIAL PURPOSES,

GENERATED FROM

BITUMINOUS SLACK COAL

BY THE

LOOMIS PROCESS.

The most Economical Gas-Generating System in the World.

Process and Apparatus patented in all Countries.

Many industrial Works in America are successfully using this Process in the manufacture of Steel, Pipes, Saws, Files, Cutlery, Watches, Pottery, Tiles, &c.

A Plant has been put into operation at the Works of Messrs. Thos. Firth and Sons, Limited, Sheffield; and they have decided to enlarge it. Other Plants are being erected in Great Britain and on the Continent.

For particulars apply to

NEWTON, CHAMBERS, & Co., Limited,

THORNCLIFFE IRON-WORKS,

Near SHEFFIELD.

JOHN BROWN & CO., LIMITED,

ATLAS STEEL AND IRON WORKS, SHEFFIELD,

ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 19-candle gas per ton.

Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

FACE YOUR RETORT MOUTHPIECES.

JOHN RUSCOE calls attention to his Retort Mouthpiece and Lid Facing Machines, which are in extensive use; also to his Lathes, Drilling, Slotting, Grooving, and Planing Machines, Smiths' Hearths, Smithy Fans, Roots' Blowers; also special Screwing Machines for Gas Tubes and Bolts, Taps, Wrenches, Pipe Cutters, special Taper and Twisted Rymers, Drills, &c.

PATENT TWISTED TAPS, DIES, & CUTTERS.

Thousands in constant work, give universal satisfaction.

Work Easier, Less Friction, Last Longer, and do Better Work than straight Grooves.

Main Drilling Stand, with Cup Drills, 1¼ to 6 inch; Taps, Rymers, and Drills.

Ratchet Screwing Stocks, and Adjustable Once-up Stocks, Dies, Guides &c.

Inquiries and Trial Orders Solicited. Everything Guaranteed. Apply to

JOHN RUSCOE, Albion Works, Hyde, near Manchester.

CAST-IRON PIPES, ETC.

THOMAS SPITTLE, LTD.

[ESTABLISHED OVER 50 YEARS.]

CAMBRIAN FOUNDRY, NEWPORT, MON.,

MAKERS OF

CAST-IRON PIPES FOR GAS, WATER, AND STEAM.

ALSO

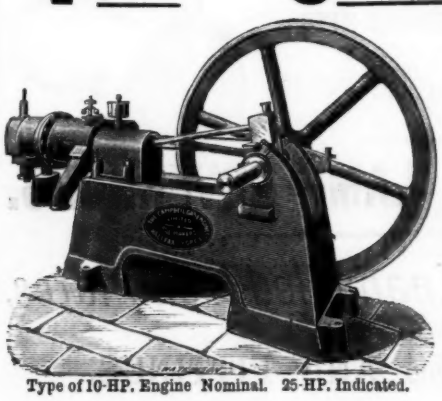
Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.

ALSO ALL WROUGHT-IRON WORK.

THE LARGEST MAKERS IN WALES.

THE "CAMPBELL" GAS-ENGINE.

GREAT SUCCESS.



Type of 10-HP. Engine Nominal. 25-HP. Indicated.

20 PER CENT. CHEAPER THAN ANY OTHER.

Gives the Highest Satisfaction with all kinds of Work.

Testimonial from Mr. JAMES MOON, Engineer to the Filey Gas-Works.

Feb. 9, 1889.

GENTLEMEN,—We have been using one of your Gas-Engines on our Works for about four months, and I have pleasure in saying that it does its work in a very satisfactory manner. The engine is half-horse power, steady in all its movements, and, with ordinary care, will drive the exhaust apparatus at an even gauge.—I remain, Yours respectfully.

(Signed) JAMES MOON.

For Price Lists and full particulars, apply to the Sole Makers:

THE CAMPBELL GAS-ENGINE Co. LIMITED,

WELL LANE, HALIFAX, YORKS.

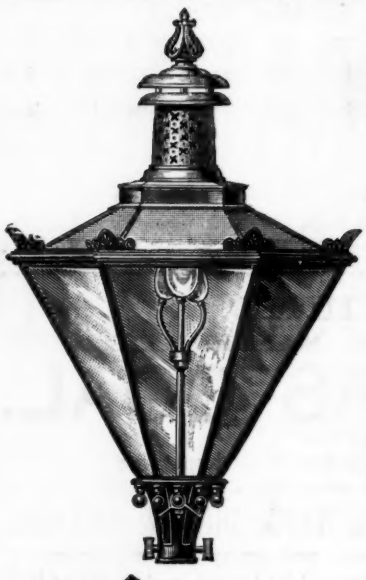
D. HULETT & CO., LIMITED,

GAS ENGINEERS,

55 and 56, High Holborn, London,

MANUFACTURERS OF EVERY DESCRIPTION OF GAS-FITTINGS,

GAS-METERS, GAS-LAMPS, GOVERNORS, ETC.



HIGH-POWER LAMPS

OF THE MOST IMPROVED CONSTRUCTION.

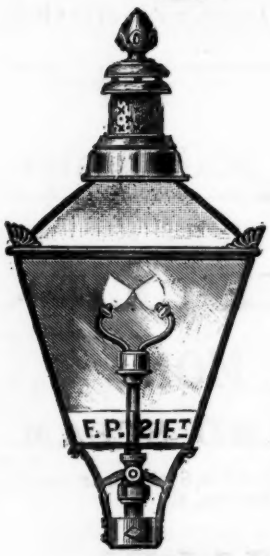
STRONG COPPER TOPS.

PATENT GOVERNOR BURNERS,

Giving from 16 to 450 Candle Power.

D. HULETT & Co., Limited,

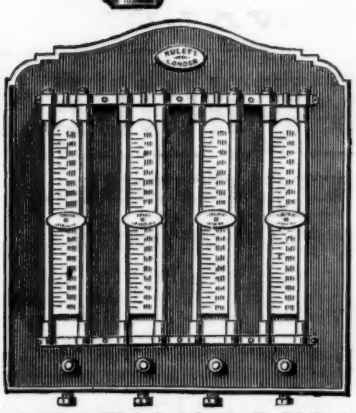
Invite Gas Companies and Local Authorities to compare the Quality of these Lamps with other Makers'.



PATENT STREET LAMPS.

NO PUTTY REQUIRED.

Several thousands of these have been made, and are giving every satisfaction. New Glass can be inserted in a few minutes by any inexperienced person.

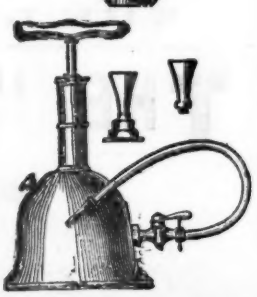


HULETT'S

Patent Service Cleanser,

FOR REMOVING OBSTRUCTIONS IN SERVICE-PIPES AND MAINS.

No Gas Company should be without this Valuable Invention.



PATENT STREET LAMP GOVERNORS.

STATION PRESSURE GAUGES, on Enamelled Iron Plates.

WROUGHT AND CAST IRON TUBES AND FITTINGS.

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PERKINS & Co.,

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Cable Address: "PERKINS, NEW YORK." *Post Office Box 3695, New York.*

SOLE AGENTS FOR THE CELEBRATED

BRECKENRIDGE CANNEL

AND THE

OLD KENTUCKY BOGHEAD

OF KENTUCKY, U.S.A.

These Cannels will rank with the Australian Shale for Gas Manufacture.

Also General Sales Agents for

PENNSYLVANIA & VIRGINIA GAS COALS, & AMERICAN FOUNDRY & FURNACE COKE.

Delivery Prices made to any Port in

GREAT BRITAIN, ON THE CONTINENT, OR SOUTH AMERICA.

Full Information furnished upon Application to the above Address.

GAS COAL.

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REAL OLD SILKSTONE GAS COAL.

Address, THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

The Schülke Regenerative Lamp

FOR
DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the Common Flat-Flame Burners.

Lamps giving 20-Candle power consume less than four feet of Gas per hour.

PURE WHITE & PERFECTLY STEADY LIGHT,
NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (Brackets or Suspending).
Can be fixed in a few minutes.

May be seen at the Offices of the

SCHÜLKE GAS-LAMP Co.
LIMITED,
Room 446—11, QUEEN VICTORIA STREET,
LONDON, E.C.,
Where Price Lists and full particulars may be obtained.

BELL'S ASBESTOS AQUOL PAINT

IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY **40** PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

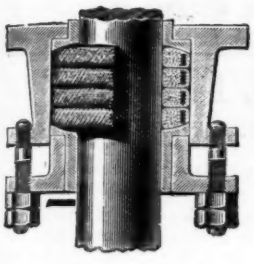
BELL'S ASBESTOS COMPANY, LIMITED,

SOUTHWARK, LONDON, S.E.

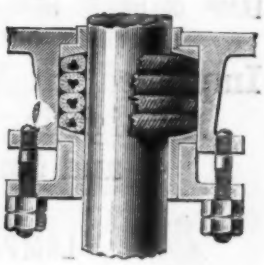
DEPOTS—MANCHESTER: Cable Street, Blackfriars. LIVERPOOL: 2, Strand Street, James Street. HULL: Humber Dock Basin. GLASGOW: 35, Robertson Street. DUBLIN: 2, St. Andrew Street. AMSTERDAM: 264, N. Z. Voorburgwal. BERLIN, BARCELONA, and ANTWERP.
AGENTS—BIRMINGHAM: BELL and Co., 7, John Bright Street. CARDIFF: BELL and Co., West Bute Street.

BELL'S ASBESTOS DAGGER PACKING

PATENT No. 15,493.



ROUND



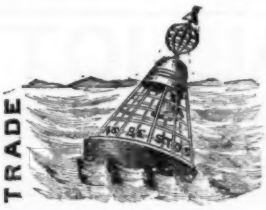
SQUARE. Every 10 feet has Label as above, and bears our Trade Mark.

Under this registered title are included the inventions of Mr. Field; and experience has proved them to be the MOST EFFICIENT DURABLE, and ECONOMICAL PACKINGS ever made. They constitute such a combination of Asbestos and India-rubber as secures the maximum of elasticity and heat resistance; and they are, therefore, UNEQUALLED FOR EVERY KIND OF ENGINE. These Packings are being universally used by most of the leading Steamship Companies throughout the world for ordinary Compound, Triple, and Quadruple Expansion Engines of the latest types. The packings are composed of rolled Asbestos Cloth, but the India-rubber is placed in two forms to suit various cases.

IN ORDERING STATE WHETHER SQUARE OR ROUND IS REQUIRED.

BELL'S ASBESTOS CO., Ld.

DEPÔTS.
MANCHESTER: Cable St., Blackfriars.
LIVERPOOL: 2, Strand St., James St.
HULL: Humber Dock Basin.
GLASGOW: 35, Robertson Street.
DUBLIN, BERLIN.



DEPÔTS.
AMSTERDAM: 264 N. Z. Voorburgwal, BARCELONA, and ANTWERP.

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BELL'S ASBESTOS

YARN AND SOAPSTONE PACKING

Is the BEST LOCOMOTIVE PACKING made.

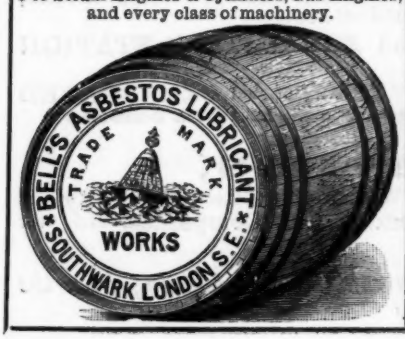
BELL'S

COMPOUND HYDRAULIC PACKING

Is specially suited for Hydraulic Machinery, Accumulators and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT

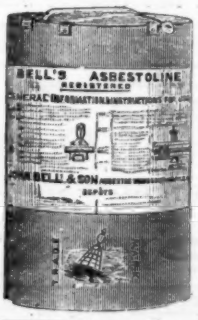
Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



BELL'S ASBESTOLINE

The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.



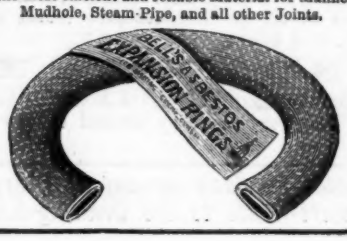
ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL. Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS

EXPANSION SHEETING

RINGS, AND TAPE.

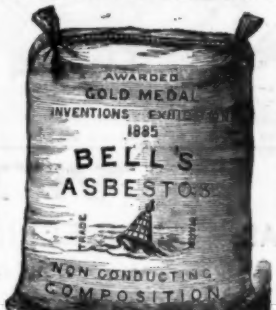
Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.



BELL'S ASBESTOS

NON-CONDUCTING COMPOSITION.

Will reduce loss by radiation nd saves 40 per cent. of fuel. Is superior to any other, and save ite cost in a few months.



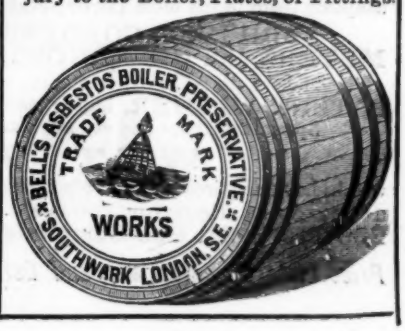
Can be applied again after many years' service. Is sent out dry in bags: therefore cheaper than others sent out wet.

ALL BAGS ARE MARKED AS ABOVE.

BELL'S ASBESTOS

BOILER PRESERVATIVE

Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



S. PONTIFEX & CO.,

GAS and WATER ENGINEERS,

Manufacturers of and Contractors for the Maintenance of

PUBLIC LAMPS & LANTERNS;

GLASS—Flint Opal, and Bent in Stock, and Cut to Sizes.

WELL LAMPS, STREET NAME TABLETS,

LAMP COLUMNS, HEAD IRONS, PUTTYLESS LAMPS,

LANTERN COCKS, REGULATORS,

Improved High-Power Lanterns for Lighting Street Refuges and Open Spaces.

BROWN'S PATENT

LAMPLIGHTERS' TORCHES.

PROPRIETORS AND MANUFACTURERS OF

BOX'S PATENT

PUTTYLESS STREET LAMP.

This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

S. PONTIFEX & CO., 22, COLEMAN ST., LONDON.

Works: 18, STEPHEN STREET, TOTTENHAM COURT ROAD, W.

PATENT GLASS LAMPS & COVERS

For Streets, Railway Platforms, &c., &c.

(Patented the 4th of May, 1889.)

This Lamp and Top, being made entirely of Glass, is perfectly impervious to corrosion, and therefore invaluable in Manufacturing and other Towns. The Top can be had in clear or coloured Glass and is much cheaper than the old style of metal frames. The New Lamp can be adapted to the old metal frame top.

Prices on application.

PILKINGTON BROS.,

Glass Works, St. Helens, Lancashire.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP.

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

HENRY GREENE & SONS,

SOLE CONSIGNEES FOR GREAT BRITAIN & COLONIES

153 TO 155, CANNON STREET,

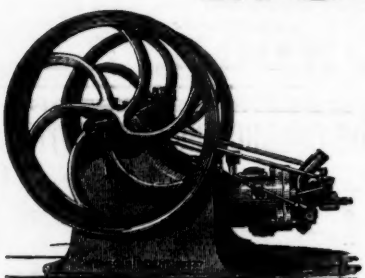
LONDON BRIDGE, E.C.

MANLOVE, ALLIOTT, & CO., LTD.,

ENGINEERS,

NOTTINGHAM,

LONDON, MANCHESTER, AND GLASGOW.



From a Photo. of a nominal 6-h.p. Engine.

ATKINSON'S **"CYCLE"** PATENT

GAS-ENGINE.

The simplest and most economical Gas-Engine made.

THE BEST ENGINE FOR ELECTRIC LIGHT.

Consumes less Gas per brake horse power than any other Gas-Engine.

TELEGRAPHIC ADDRESS: "MANLOVES NOTTINGHAM."

WILLEY & CO.,

GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.

London Offices: 6 & 7, KING WILLIAM STREET, E.C.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS,

GASHOLDERS, Telescope and Single-Lift, any size. Some of the largest in the Kingdom erected by this Firm are giving the highest satisfaction.

PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **Mr. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

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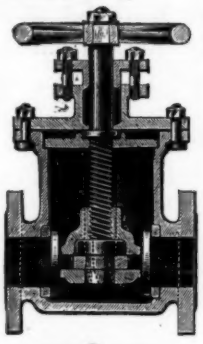

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SLOW-SPEED CONDENSER
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Have been supplied for many years, and are now in successful operation, for the purpose of

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The Machine acts as an Exhauster, drawing the Gas from the Main and propelling it according to the Pressure required. The result is obtained by a Wet-Meter Drum, which is revolved by Multiplying Wheels and Pullies, actuated by a Weight, as shown in the Engraving. The Pullies may be so arranged as to keep the Apparatus at Work for many hours, provided only there is sufficient depth for the Weight to fall. Pressure Raisers have been successfully employed in connection with Apparatus for the Manufacture of Oil Gas, &c. They are also used for supplying a current of Air for various purposes.

TESTIMONIALS.

From Peter W. Barlow, Esq., F.R.S., F.G.S.
Engineer to the Tower Subway Co.

56, Landsdowne Road, W.,
Feb. 21, 1888.

DEAR SIRS,

The Gas-Pressure Engine in the Tower Subway acts most satisfactorily. It requires very little attention, and is very rarely out of order.

I am, yours truly,
PETER W. BARLOW.

Cork Gas Consumers' Company,
Gas-Works, Cork,
20th Feb., 1888.

GENTLEMEN,

In reply to yours, I beg to say that the Motive-Power Meters with which you have supplied this Company are doing very well. With them we are able to give a good supply to consumers in districts where it would be otherwise difficult to do so.

I am, faithfully yours,
THOMAS TRAVERS,
Engineer.

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(See also Advt., p. 1114.

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